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Health and Population: Perspectives and Issues



राष्ट्रीय स्वास्थ्य एवं परिवार कल्यााण संस्थान स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार के अंतर्गत एक स्वायत्तशासी निकाय The National Institute of Health and Family Welfare An autonomous organization, under the Ministry of Health and Family Welfare, Government of India बाबा गंगनाथ मार्ग, मुनीरका, नई दिल्ली– 110067 Baba Gangnath Marg, Munirka, New Delhi-110067

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| | | |

| S. No. | Contents | Page No. |
|--------|---|----------|
| E | litorial | |
| | Air Pollution and National Clean Air Programme in India Vaishali Bhole | 72-79 |
| 1. | A Study to Assess the Knowledge and Perceptions regarding Pictorial Health Warnings on Tobacco Products among the Undergraduate Students in Delhi Akriti Dheer and Poonam Khattar | 80-89 |
| 2. | Relationship between Body Mass Index and Musculoskeletal Disorders among Women Cultivators Amitava Pal, Sujaya De, Piyali Sengupta, Payel Maity and Prakash C. Dhara | 90-99 |
| 3. | Universal Health Coverage and Role of Health Insurance J.B. Babbar and Kunal Babbar | 100-115 |
| 4. | Fire Safety In Hospitals- Issues and Challenges Amarendra Pattnaik and Abhisek Kumar | 116-122 |
| 5. | Accessibility of Primary Health Care to Urban Poor: A Study in Pune, India Neha Verma Madan | 123-137 |
| 6. | Cost Analysis of Dental Disease Drugs in India: Efficiency in Central Procurement System Pankaj Talreja and Rosy Kalra | 138-150 |

Editorial

Air Pollution and National Clean Air Programme in India

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Vaishali Bhole*

India is home to 21 of the world's 30 most polluted cities. From smog hanging over the cities to smoke inside homes, air pollution poses a major threat to health and climate. More than 80 per cent of the people living in urban areas that monitor air pollution are exposed to air quality levels that exceed WHO guideline limits, with low and middle income countries suffering from the highest exposures, both indoors and outdoors. Air pollution in the national capital region (NCR) worsened post Diwali, repeating a trend that exposes how efforts put in place in recent years like the Supreme Court orders, new laws, penalties, and even cleaner fuel have failed to stop the recurrence of an annual crisis. Air pollution is a silent killer, causing over seven million deaths a year globally due to the poor outdoor and indoor air quality. The World Health Organization (WHO) estimates that nine out of ten people worldwide today breathe air which is unsafe, with most of these people living in low and middle-income countries^{1,2}. While the adverse health effects of polluted air affect everyone, regardless of their age, economic status or where they live, our most vulnerable populations that are children, elderly and the poor are hit the hardest. A nationwide survey, published in Lancet Planetary Health on 6 December 2019 found that at least 12.5 per cent of the deaths in 2017, or one in eight, can be attributed to unusually high rates of lower respiratory infections, heart disease, strokes, lung cancer, and diabetes which are a result of severe air pollution in a certain percentage of cases. Of the 1.2 million who died of air pollution-related causes, 51.4 per cent were younger than 70 years old³.

In total, more than three quarters of India's population is exposed to air pollution that's higher than the recommended level set by the Government of India. That level, in turn, is four times the maximum recommended by the World Health Organization. No Indian state achieves pollution levels at or below the WHO's limits.

Figure 1 Disability Adjusted Life Years (DALY) Rates Attributable to Air Pollution and Tobacco Use in India, 2017



Figure 3: DALY rates attributable to air pollution and tobacco use in India, 2017 Error bars represent 95% uncertainty intervals. DALY=disability-adjusted life-year.

Types of Air Pollutants and Sources

There are many air pollutants such as sulfates, nitrates, and black carbon but exposure to tiny particulates smaller than 2.5 microns, known as PM 2.5 which penetrates the lungs, is generally used as an overall measure of air quality. The major components of air pollution in India are ambient particulate matter, household air pollution, and to a smaller extent, ozone in the troposphere. In India, the major sources of ambient particulate matter pollution are coalburning for thermal power production, industry emissions, construction activity and brick kilns, transport vehicles, road dust, residential and commercial biomass burning, waste burning, agricultural stubble burning, and diesel generators⁴. Household Air Pollution (HAP) is caused mainly by the residential burning of solid fuels for cooking and to some extent heating, the major types of which are wood, dung, agricultural residues, coal, and charcoal⁵. Ground level ambient ozone is produced when nitrogen oxides and volatile organic compounds emitted from transport vehicles, power plants, factories, and other sources react in the presence of sunlight⁶. Rapidly developing countries such as India face the dual challenge of exposures from both ambient and household air pollution⁷. Existing evidence suggests that India, with a population of 1.38 billion people at different levels of economic, social, and health development, has one of the highest air pollution levels in the world⁸. Evidence also suggests that air pollution is a major risk factor for disease burden in India and has one of the highest exposure levels to air pollution globally¹. Most places in the country exceed the WHO defined safe air quality standards multiple times over. Nearly half of the worst 50 polluted cities in the world are in India.

Air Quality Index (AQI)

The Air Quality Index (AQI) is an index for reporting daily air quality. It tells how clean or polluted the air is, and what associated health affects might be a concern for the public. Traditionally, air quality status used to be reported through huge data. Thus, it was important that information on air quality was put up in public domain in simple linguistic terms that is easily understood by a common person. AQI is one such tool for effective dissemination of air quality information to people. The AQI focuses on health affects people may experience within a few hours or days after breathing polluted air. For each of these pollutants, the Central Pollution Control Board (CPCB) has established national air quality standards to protect public health⁹. Ground-level ozone and air-borne particles are the two pollutants that pose the greatest threat to human health in India. AQI as a vardstick is from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. The AQI considers eight pollutants (PM₁₀, PM₂₅, NO₂, SO₂, CO, O₃, NH₃, and Pb) for which short-term (up to 24-hourly averaging period) for measuring National Ambient Air Quality Standards. Based on the measured ambient concentrations, corresponding standards and likely health impact, a sub-index is calculated for each of these pollutants. The worst subindex reflects overall AQI. Associated likely health impacts for different AQI categories and pollutants have also been suggested, with primary inputs from the medical expert members of the group. The AQI values and corresponding ambient concentrations (health breakpoints) as well as associated likely health impacts for the identified eight pollutants are given in the table below.

| AQI Category, Pollutants and Health Breakpoints | | | | | | | | |
|---|---------------------------|----------------------------|--------------------------|------------------------|---------------------------------|--------------------------|--------------------------|-------------|
| AQI Category (Range) | PM ₁₀ 24-hr | PM _{2.5} 24-hr | NO ₂ 24-hr | O ₃ 8-hr | CO 8-hr (mg/m ³) | SO ₂ 24-hr | NH ₃ 24-hr | Pb 24-hr |
| Good (0-50) | 0-50 | 0-30 | 0-40 | 0-50 | 0-1.0 | 0-40 | 0-200 | 0-0.5 |
| Satisfactory (51-100) | 51-100 | 31-60 | 41-80 | 51-100 | 1.1-2.0 | 41-80 | 201-400 | 0.5 -1.0 |
| Moderately polluted (101-200) | 101-250 | 61-90 | 81-180 | 101-168 | 2.1-10 | 81-380 | 401-800 | 1.1-2.0 |
| Poor (201-300) | 251-350 | 91-120 | 181-280 | 169-208 | 10-17 | 381-800 | 801-1200 | 2.1-3.0 |
| Very poor (301-400) | 351-430 | 121-250 | 281-400 | 209-748* | 17-34 | 8 0 1 - 1600 | 1200-1800 | 3.1-3.5 |
| Severe (401-500) | 430 + | 250+ | 400+ | 748+* | 34+ | 1600+ | 1800+ | 3.5+ |

Table 1Pollutants for Measuring AQI

*One hourly monitoring (for mathematical calculations only)

| AQI | Associated Health Impacts |
|-------------------------------|---|
| Good (0–50) | Minimal Impact |
| Satisfactory (51–100) | May cause minor breathing discomfort to sensitive people. |
| Moderately polluted (101–200) | May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults. |
| Poor (201–300) | May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease |
| Very Poor (301–400) | May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases. |
| Severe (401-500) | May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity. |

Graded Response Action Plan (Grap) and Effects of Air Pollution

When AQI crosses certain thresholds for 48 consecutive hours, Graded Response Action Plan (Grap) comes in to force The curbs are part of the 'Grap' that lays down sets of restrictions, the most serious of these include a ban on trucks, odd-even restrictions for vehicles on road, an embargo on construction work, and an advisory to governments to shut schools.

Air pollution is the deadliest form of pollution and has serious health and economic costs. 'The Cost of Air Pollution: Strengthening the Economic Case for Action', a joint study of The World Bank and the Institute for Health Metrics and Evaluation, estimated that in 2013, premature deaths caused by air pollution cost the world \$225 billion in lost labour income and a staggering \$5 trillion in welfare losses.

High levels of air pollution can aggravate respiratory and cardio-vascular illnesses, accelerate the aging of the lungs, and cause diseases such as asthma, bronchitis and Chronic Obstructive Pulmonary Disease. An estimated one-third of the deaths globally from stroke, lung cancer and heart disease are caused by air pollution. Toxic air has now also been linked to dementia,

Alzheimer's and declining mental health. These impacts are so significant that the international community working on prevention and control of non-communicable diseases, has recently added environmental risk factors to its list of the traditional four risk factors for these diseases that is tobacco use, harmful use of alcohol, unhealthy diets, and physical inactivity.

India has one of the highest annual average ambient particulate matter PM2.5 exposure levels in the world. In 2017, no state in India had an annual population weighted ambient particulate matter mean PM 2.5 less than the WHO recommended level of 10 μ g/m³, and 77 per cent of India's population was exposed to mean PM2.5 more than 40 μ g/m³ which is the recommended limit set by the National Ambient Air Quality Standards of India. Although the use of solid fuels for cooking has been declining in India¹⁰, 56 per cent of India's population was still exposed to household air pollution from solid fuels in 2017. Control of ambient particulate matter pollution requires action in several sectors and the linkage of these actions for greatest impact. Several studies have estimated the contribution of various sources to particulate matter pollution in different parts of India, which can be useful in informing the efforts that are needed to address these sources.

Mitigation of Air Pollution

There has been an increasing focus on addressing air pollution in India by the government and other stakeholders in recent times¹. Several government initiatives have been launched in the past few years to reduce air pollution. These include various steps taken by the Ministry of Environment, Forest and Climate Change and other government departments.

In 2018, India launched the National Clean Air Programme (NCAP)¹¹ which provides a roadmap to prevent, control, and reduce unhealthy air pollution. The NCAP expanded the national air quality monitoring network for air pollution management, and strengthening public awareness about the dangers of air pollution. It is a time-bound national strategy to bring down the levels of deadly particles of air pollution ($PM_{2.5}$ and PM_{10}) by 20-30 per cent by 2024 (compared to 2017 levels). Initially launched as a five-year action plan, the NCAP may be further extended after a mid-term review of the outcomes.

The NCAP operates in close collaboration and coordination among the central ministries, state governments and local bodies. The aims of the plan align with the existing policies and programmes including the National Action Plan on Climate Change, initiatives on electric vehicles, the Smart Cities Mission among others. Inter-sectoral groups including participation from the Ministry of Road Transport and Highways, Ministry of Petroleum and Natural Gas, Ministry of New and Renewable Energy, Ministry of Heavy Industry, Ministry of Housing and Urban Affairs, Ministry of Agriculture, Ministry of Health, NITI Aayog, and Central Pollution Control Board are encouraged to work on to mitigate the problem of air pollution.

An Apex Committee of the Ministry of Environment, Forests and Climate Change (MoEFCC) at the national level, and at the Chief Secretary level in the States oversee implementation. The NCAP also facilitates partnerships with multi and bilateral international organizations, philanthropic foundations, and leading technical institutions, experts from industry, academia, and civil society to accomplish its goals. The NCAP also provides specific sectoral interventions for mitigation actions for key sectors that are known to contribute to air pollution in many cities. These include re-suspended road dust control, construction and demolition related dust, power

sector and industrial emissions, transport sector emissions, agricultural emissions, emissions from unsustainable waste management practices. The NCAP has been allocated a budget of INR 300 crore (USD 42.6 million) for the first two years.

Various other ministries' contribution in combating air pollution is as follows:

- Ministry of Environment has set emission standards for the brick manufacturing industry and facilitate management of agricultural residues to reduce stubble burning.
- Mechanisms that help to reduce air pollution included in the Smart Cities Mission launched by the Government of India.
- ➢ About two-third of the electricity in India is produced from fossil fuels, mainly coal but India has pledged in the Paris Climate Agreement to generate 40 per cent of its electricity from renewable sources by 2030.
- Ministry of Power by reduction in particulate matter emissions by coal power plants and reduction in energy consumption by energy-intensive industries.
- Ministry of Road Transport and Highways; and Ministry of Petroleum and Natural Gas by setting stricter vehicle emission regulation and upgrading of vehicles to more fuelefficient standards, and upgrading vehicles to Bharat Stage VI (equivalent to Euro-VI standard) vehicle emission standards.
- Ministry of Urban Development by enhancing availability of public transport and promotion of electric public transport fleets.
- Government initiatives to reduce solid fuel use for tackling household air pollution include a major scheme initiated by the Prime Minister of India in May 2016- the *Pradhan Mantri Ujjwala Yojana*. This scheme had planned to provide clean and safe cooking fuel (liquefied petroleum gas) to 50 million low-income households by March 2019 by adding 10,000 more distributors, increasing access, and covering nearly all the upfront costs of switching for low-income households. The original target of 50 million households was met in August 2018 itself, and the government has now increased the target to reach 80 million households through this scheme with a total budget of US\$1.8 billion. Liquefied petroleum gas meets the International Standards Organization and WHO recommendations, and can potentially help in achieving the WHO air quality standards within homes but adoption and sustained use of clean fuels by households will be needed.
- State-specific policies such as use of compressed natural gas by vehicles in Delhi, subsidies for alternative technologies to compost agricultural waste instead of burning it in Punjab, and mandatory use of fly ash in the construction industry within 100 km from coal or lignite thermal plants in Maharashtra could be expanded to other states to efficiently control particulate matter emissions⁸.
- Another initiative is the Clean Air for Delhi Campaign launched in early 2018 which subsequently led to the launch of the National Clean Air Programme that aims to sensitise the public and enhance coordination between the implementing agencies for control of air pollution across the country.
- Other initiatives such as the Intended Nationally Determined Contributions targets to reduce particulate matter emission intensity by 33–35 per cent by 2030.

Challenges to Public Health

The very high ambient particulate matter pollution levels in north India in the winter season result in attention to this matter by the media and public with discussion often focusing on the acute health problems due to high pollution, whereas the much more important longer-term adverse health effects of chronically high pollution levels throughout the year have yet to be fully realized. More awareness needs to be created about the slow but substantial impact of ambient particulate matter and household air pollution among policy makers and the general public which would help further enhance the air pollution control efforts in India.

What Can be Done to Combat Air Pollution?

The NCAP is a much-needed start to strengthen the efforts in combating air pollution. The NCAP is the first step of the government with a time bound target for particulate matter reduction. The NCAP's focus on coordinated city, state, and regional actions, evidence-based policy making, public outreach, and accountability is heartening. Yet, while the NCAP touches upon many of the key issues that need to be addressed, the country's air pollution challenge is complex and requires sustained, multi-sectoral approaches to be implemented over the long term. India cannot afford to delay action on air pollution and this programme can help in streamlining actions by stakeholders towards the common goal of providing clean air to millions.

The ongoing National Clean Air Programme cannot be based on the principle of 'cooperative and participatory approach'. It should be under the Environment Protection Act or any other Act to have a firm mandate with a strong legal back up for cities and regions to implement plans in a time bound manner for effective reduction. Following the order of National Green Tribunal, 102 cities have already started to prepare their first baseline action plans based on available data and expertise. This will have to be taken forward with the right governing principles, detailed qualitative and quantitative indicators for strategy development for each sector for effective reduction.

Inter-ministerial coordination and multi-sectoral interventions for national programme with the air quality target.

- Strong multi-tiered accountability system to hold implementing agencies accountable and responsible to achieve Air pollution reduction target which require cities and regions to adopt scale, depth and stringent action with detailed pathways for clean energy and mobility transition, waste and dust management and control of combustion sources.
- Timely implementation of BSVI emissions standards in April 2020 and control of real world emissions from vehicles on roads to cut vehicular pollution, support integrated public transport system along with walking and cycling infrastructure and bring in zero emissions mandate for quick change over to electric mobility.
- In the industry sector, quick implementation of new power plant standards, new nitrogen oxide and sulphur dioxide standards for 34 group of industries, eliminating dirty fuel streams, controlling fugitive emissions from small scale industries and getting all brick kilns to improve kiln technology should be the focus.
- Enforce strong deterrence for non-compliance.
- Use innovative health-based strategies for 100 per cent coverage of households with clean fuels of LPG and electricity. Income, education, and urban location have been shown to be associated with the adoption of cleaner stoves and fuels, and better understanding

of the role of uninterrupted fuel availability and prices as well as household size, composition, and gender roles in decision making can help to achieve sustained use. Furthermore, several studies report residential biomass use-related emissions to be one of the largest contributors to population-weighted ambient PM2·5 concentrations. Targeted and innovative subsidies for liquefied petroleum gas appear necessary to increase and sustain the use of clean cooking fuels, and have the potential to transform the associated expenditures into social investments.

- Promote natural gas across sectors and renewable energy aggressively.
- Strengthen municipal services for segregation and recycling of waste to prevent waste burning. Scale up strategies for dust control and recycling of construction and demolition waste.
- Need local controls in stone crushers and mining areas and strengthen forest protection and plantation for green walling.
- The National clean air programme requires robust fiscal and funding strategy to meet the costs and for longer-term sustainability and affordability of the schemes.
- Both central and state governments will have to adopt 'polluter pay' based taxation mechanism to mobilize resources for dedicated funding of pollution control action and also to discourage polluting products, processes and activities. For instance, in Delhi, an environment pollution charge is slapped on entry of each truck, on purchase of each big diesel car and SUV as well as on each litre of diesel fuel sold. This revenue then funds clean air programme. Without a funding strategy the national clean air programme will become a simple wish list.

There is need to re-evaluate 'Grap'. We need to have a re-look at what preventive measures should be enforced at what time, and how much Grap measures are helping to stop the recurrence of an annual crisis that plunges the National Capital region into a public health emergency. A recent research of the Harvard University T.H. Chan School of Public Health found that the small increases of particulate matter pollution associated with a 15 per cent increase in the Covid-19 death rate. The findings are consistent with previous research on the SARS outbreak which provide "a motive for expanded follow up investigations as more and higher quality Covid-19 data become available," as well as a reason to continue enforcement of air pollution regulations.

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A Study to Assess the Knowledge and Perceptions regarding Pictorial Health Warnings on Tobacco Products among the Undergraduate Students in Delhi

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Abstract

According to WHO, 7 million people die due to tobacco use each year globally. As per GATS 2, since a large population in India is consuming tobacco, it becomes very important to focus on the general population as a whole to prevent adding new users. Health warning labels on tobacco product packages have been established as one of the most cost-effective tools for creating awareness about the health risks of tobacco use among both tobacco users as well as non-users. A descriptive cross-sectional study was conducted among 221 under graduate students of Delhi. Primary data were collected from the 221 tobacco users and non-users using a questionnaire. The study revealed that 94.6 per cent of the students had noticed pictorial health warnings (PHW) on cigarette packages, 51.1 per cent on bidi packages and 71.1 per cent on smokeless packages. Though overall 52.9 per cent of the users reported having ever thought of quitting due to PHWs, very less percentage of cigarette smokers (39.5%), bidi (27.3%) and smokeless tobacco (50%) users had thought of quitting in the last 30 days of data collection. Overall 71.9 per cent of the students found gory pictures scary which had an effect on leading thoughts to quit due to PHWs among tobacco users. Whereas, 62.7 per cent of the users were aware of the current pictorial health warning being used, only 39.2 per cent of them was aware of its correct location on tobacco packages. PHWs play a dynamic role in preventing tobacco use among non-users and motivating to quit among the users. Young age is the period when health risking behaviours can be prevented and modified to move towards a healthy tobaccofree nation. The study revealed that a large proportion of students had noticed the PHWs on the tobacco packages. Many had thought of quitting because of PHWs on the packs. PHWs act as a strong means of educating and motivating the young as well as general public about the potential health hazards of tobacco use. Gory, good quality PHWs have been successful in arousing an intention to quit tobacco use among the users and not to start among the non-users. There is a need for conducting research studies on the perceived effectiveness of Pictorial Health Warnings as a deterrent of intention to smoke and as a stimulant to encourage the tobacco users (the smokers, non-smokers and smokeless tobacco products) as a cost-effective means of sensitizing about the dangers of tobacco use.

Key words: Pictorial health warnings, tobacco, knowledge, perception, undergraduate students, warning label.

More than seven million people die of tobacco use each year, both from direct tobacco use and second-hand smoke¹. India is the third largest tobacco producing nation and the second largest

consumer of tobacco products world-wide. According to the Global Adult Tobacco Survey (GATS) 2016-17, the prevalence rate of tobacco use among 15 years of age or older was 28.6 per cent (266.8 million) and in Delhi, it was 17.8 per cent². Mortality due to tobacco in India is estimated at upwards of 1.3 million. Out of these, one million are attributed to tobacco smoking and the rest to smokeless tobacco (SLT) use. If the current trends continue, tobacco will account for 13 per cent of all deaths in India by 2020³.

To control the rising tobacco epidemic in the country, one of the steps taken is to include large, graphic warnings or pictorial warnings on the cigarette, bidi and chewing tobacco packs. Health warning labels on tobacco product packages have been established as one of the most cost-effective tools for creating awareness about the health risks of tobacco use among both tobacco users as well as non-users⁴. These health warnings are designed with an aim at reducing tobacco use by communicating the health hazards of tobacco use, encouraging quitting among users, preventing non-users from initiating, and preventing former users from relapse⁵.

Article 11 of the WHO Framework Convention on Tobacco Control (FCTC) proposes that health warnings and messages on tobacco product packaging and labeling should be 50 per cent or more but not less than 30 per cent of the principal display areas⁶. In India, warnings on tobacco products are mandated under the Section-7 of The Cigarettes and Other Tobacco Products (Prohibition of Advertisement & Regulation of Trade & Commerce, Production, and Supply & Distribution) Act, 2003 (COTPA)⁷.

India implemented the large health warnings covering 85 per cent of the principal display area in April 2016. This notification has led to reduction in space available to manufacturers to glorify the packages. India now has the 5th largest warning label in the world⁸. Newer health warnings have come into force with effect from 1 September 2018 with a provision of displaying the Quitline number⁹. These health warnings are same on all tobacco packages including cigarette, bidi and smokeless tobacco packages. Keeping this in view, a study was designed to study the effect of new pictorial health warnings on the tobacco packs.

Methodology

The present descriptive cross-sectional study was conducted during 1 April 2019 – 30th April 2019 among a convenient sample of 221 undergraduate students in the age group of 18-23 years attending selected colleges of Delhi. This study was undertaken to assess the knowledge and perceptions regarding pictorial health warnings (PHWs) on tobacco products. A questionnaire was developed which included four latest pictorial health warnings by the Government of India. It was pre-tested and modified as per the feedback received. Written informed consent was taken from all the participants with ensured confidentiality.

Findings and Discussion

The findings revealed that out of the total 221 students (144 males and 77 females), 23.1 per cent (n=51) were tobacco users in any form. From among this, 25.7 per cent (n=37) was males and 18.2 per cent (n=14) was females were using tobacco in any form. Out of the total tobacco users; the smokers (cigarette, bidi) constituted about 88.2 per cent (n=45); whereas 5.9 per cent (n=3) was smokeless tobacco users (guthka, khaini, paan masala) and 5.9 per cent (n=3) was mixed users. The total cigarette smokers were 43, bidi smokers 11 and smokeless tobacco users

6; of which many were using multiple forms of tobacco. Key findings of the study with respect to PHWs included the following aspects:

Noticeability: The students were asked about the noticeability of PHWs from both users and non-users. It was taken into account that the students might have seen the PHWs on tobacco packages lying on the roads, in their homes, friend circle, paan shops, etc. and were given an option of if they had not seen any cigarette/bidi/SLT packages in the questionnaire. The findings revealed that overall 94.6 per cent (n=209) of the students had noticed PHWs on cigarette packages, 51.1 per cent (n=113) on bidi packages and 71.1% (n=157) on smokeless packages.

A comparison between findings of the current study and GATS (2016-17)³ with regard to percentage distribution of cigarette and bidi smokers, and SLT users who noticed PHWs on cigarette, bidi and SLT products reveals almost similar findings as illustrated in the figure below.





The present study revealed that 97.7 per cent (n=42) of cigarette smokers had noticed health warnings on cigarette packs which also supports the findings of GATS (2016-17)³, India whereby 92.5 per cent in the age group of 15-24 years had noticed the same. For Delhi State (aged 15 and above), the corresponding figure of GATS (2016-17)³ is 86.9 per cent. A reason for the slight difference could be due to the fact that the present study was conducted only in the urban setup. A study by Bhardwaj et al.¹⁰ has also reported that 86.9 per cent of the adults had seen PHWs on cigarette packs in the same age group.

For bidi smokers, the current study reveals that 72.7 per cent (n=08) had noticed PHWs on bidi packs which is nearly similar with the findings of GATS (2016-17)³ wherein 79.9 per cent of bidi smokers (aged 15 and above) had noticed health warnings on bidi packs in Delhi State and 78.4 per cent pan India. It is also found in the present study that 83.3 per cent (n=05) of the smokeless tobacco users had noticed PHWs on SLT packages. GATS (2016-17)³ also show similar results i.e. 84.7 per cent had noticed health warnings on SLT packages in Delhi State and 71.6 per cent all over India.

Thought of Quitting because of PHWs: The current study found that 52.9 per cent (n=27)

of the tobacco users had ever thought of quitting due to PHWs which is in contrast to a study conducted by Rekha et al.¹¹ wherein only 21.9 per cent of the study subjects tried to quit their tobacco-related habits after the introduction of pictorial warnings. The reason for this difference could be that the size of the warning in 2012 was small with only 40 per cent coverage and limited to the front panel only. Though the study by Rekha et al published in 2012, the data was collected in 2010 when the notification for 40 per cent PHWs had not passed. Another reason could be that the earlier proposed PHWs i.e. picture of lungs, scorpion were not understood properly with respect to their correlation with these PHWs to cause cancer and thus, were found to be ineffective as reported by Oswal et al.¹.

It was also found that PHWs were ineffective in causing intention to quit. 47.1 per cent (n=24) had never thought of quitting due to PHWs which was similar with the findings of the study by Dahiya et al.¹³ where 48.3 per cent reported that pictorial representation on the tobacco packets did not help them refraining from tobacco use.

In the present study, 39.5 per cent (n=17) of the cigarette smokers thought of quitting due to PHWs in 30 days preceding the study. The GATS survey reported 61.5 per cent of cigarette smokers (aged 15 and above) had thought of quitting in the last 30 days from the Delhi State due to PHWs. The corresponding figures for India is 61.9 per cent. One of the reasons of this difference could be that the present study was conducted among young college going students who may not have many opportunities and reasons to quit such as peer pressure, image building and lack of cessation facilities.

Similarly, for bidi smokers, this study shows that 27.3 cessation (n=3) had thought of quitting in the last 30 days. The corresponding figures from GATS $(2016-17)^3$ are 48.9 cessation for Delhi State (aged 15 and above) and 53.8 cessation for pan India.

When it comes to smokeless tobacco users, GATS (2016-17)³ findings reveal that 55.3 cessation had thought of quitting in the last 30 days from Delhi and 46.2 per cent across India. The present study supports these findings as 50 per cent (n=3) of SLT users had thought of quitting in the last 30 days. This is in contrast to Gravely et al.¹⁴ where only 20 per cent had reported that health warning label made them think about quitting. This difference could be due to the increase in size of the pictorial health warnings i.e. from 40 per cent to 85 per cent in the new PHWs by the Government of India.





Effect of Fear of Gory Images: The students were asked if they found gory pictures scary. Overall, 71.9 per cent (n=159) of the total students, 80.5 per cent (n=62) females, 67.4 per cent (n=97) males, 49 per cent (n=25) tobacco users and 78.2 per cent (n=133) non-users found gory pictures scary.

Table 1 Association between Ever Thought of Quitting among Tobacco Users and Fear of Gory Pictures

| From the make to grade days to DUW/s | Do gory pictures sc | Tatal | | | |
|--|---------------------|------------|------------|--|--|
| Ever thought to quit due to PHWs | Agree | Disagree | | | |
| Yes | 17 (68%) | 10 (38.5%) | 27 (52.9%) | | |
| No | 8 (32%) | 16 (61.5%) | 24 (47.1%) | | |
| Total | 25 (100%) | 26 (100%) | 51 (100%) | | |
| Pearson Chi-Square = 4.464 , df = 1, p value = 0.035 | | | | | |

In this study, there was significant association between fear (negative emotion) and ever thought of quitting i.e. 68 per cent of the users who found gory images scary had also thought of quitting because of PHWs as shown in Table 1. Also majority of the participants (70%, n=112) who found gory pictures scary were of the view that PHWs help prevent tobacco use among non-users (Table 2).

Table 2 Relationship between Fear of Gory Pictures and whether PHWs Encourage a Non-user to Not Use Tobacco

| Do PHWs encourage a non-user to not | Do gory pi | Total | | |
|--|-------------|------------|-------------|--|
| use tobacco? | Agree | Disagree | Iotai | |
| Agree | 112 (70.4%) | 30 (48.4%) | 142 (64.3%) | |
| Disagree | 26 (16.4%) | 19 (30.6%) | 45 (20.4%) | |
| Uncertain | 21 (13.2%) | 13 (21%) | 34 (15.4%) | |
| Total | 159 (100%) | 62 (100%) | 221 (100%) | |
| Pearson Chi-Square = 9.598 , df = 2, p value = 0.008 | | | | |

These findings are in line with the research conducted by Tugrul¹⁵ wherein it was reported that higher levels of fear and disgust evoked by graphic warning labels resulted in higher levels of effectiveness in discouraging non-smokers from smoking and thus, motivating the occasional smokers to not start smoking and encouraging regular smokers to quit.

A study on Canadian cigarette smokers revealed that smokers who reported greater negative emotion were more likely to have quit, attempted to quit, or reduced their smoking three months later¹⁶. Hammond in 2009 reported that fear appeals are effective when paired with strong efficacy messages for a specific outcome (i.e. quitting smoking) and strong fear appeals and high-efficacy messages produce the greatest behavioural change¹⁷.

It was also found in the current study that more percentage of women (80.5%, n=62) than men (67.4%, n=97) were scared of gory pictures. This is also in accordance with the study conducted by Tugrul¹⁵ where it has been reported that female smokers, both occasional and regular, felt more fear and disgust and also were more motivated than male smokers.

Knowledge regarding Current Pictorial Health Warning: Given the fact that there has been change in PHWs, an effort was made to find out the extent of recall of current PHWs being used on tobacco packages in India. In the present study, 62.7 per cent (n=32) of the users had correctly identified the current pictorial health warning being used on tobacco packages in India.

| | | User | Non-user | Total |
|----------|----------------|------------|-------------|-------------|
| | Current | 32 (62.8%) | 70 (41.2%) | 102 (46.2%) |
| Distance | Old | 17 (33.3%) | 69 (40.6%) | 86 (32.9%) |
| Picture | Don't know | 2 (3.9%) | 31 (18.2%) | 33 (14.9%) |
| | Total | 51(100%) | 170 (100%) | 221 (100%) |
| | Front and Back | 20 (39.2%) | 31 (18.2%) | 51 (23.1%) |
| Location | Other | 29 (56.9%) | 117 (68.8%) | 146 (66.1%) |
| Location | Don't know | 2 (3.9%) | 22 (12.9%) | 24 (10.8%) |
| | Total | 51(100%) | 170 (100%) | 221 (100%) |

 Table 3

 Knowledge regarding Current PHWs and Its Location on Tobacco Packages

One of the reasons for double-sided representation of PHWs is to reduce the area for tobacco industry and thus, make the images of PHWs more impactful. Further, though PHWs are present on both sides of the packages, only 39.2 per cent (n=20) of the users were aware of its correct location i.e. both sides. In a study conducted by Dahiya et al.¹³, 58.8 per cent of the tobacco users claimed that double-sided pictorial representations are more impactful. Lower representation regarding location of PHWs in our study of the total sample (23.1%, n=51) could be due to the fact that there is not much awareness about the same and also because people tend to avoid looking at tobacco packages.

Concern about Health Risks with Thought of Quitting

In the present study, 35.3 per cent (n=18) of the students among tobacco users were worried about the health consequences of tobacco use due to the PHWs. A majority of them who worried about the health risks of tobacco use, had also thought of quitting (88.5%, n=16). This shows an indirect relationship between worrying about health risks and thought of quitting due to PHWs. This supports the findings of the study by Emery et al.¹⁸ wherein images influenced perceived risk, immediate desire to smoke, and feelings toward quitting indirectly through affective reactions (worry about health risks of smoking).

Quality of pictorial health warnings: The students were asked about the quality of PHWs. About 44.3 per cent (n=98) of the students stated that the quality of the warnings was not up to the mark (dull, faded colour, washed out image) and some even suggested that they were not

at all clear (distorted). A study by Rajpurohit¹⁹ reported that 77.3 per cent of the users wanted to quit tobacco while 18.2 per cent were not able to understand the pictorial warninga. The finding of this study suggests that there is a need to check the enforcement of the specified resolution of PHWs provided by the Government of India for ensuring the quality of PHWs.

Rotation of PHWs: The Framework Convention on Tobacco Control, World Health Organization⁶ recommends rotating and/or replacing the content of the health warnings in order to minimize wear-out effects. Finding of a study suggests that in general, smokers get used to the presence of pictures on health warnings to a certain extent²⁰. It was also found that 60.2 per cent (n=133) of the students were in favour of changing the PHWs frequently. This supports the government policy decision of changing pictorial health warnings after a period of one year by the Government of India. Several studies also evaluated the effectiveness of a new pictorial warning compared with the old one. However, the relevance of refreshing the pictures of PHWs and the length of the effective period of continuing PHWs are less frequently studied²¹.

Conclusion

The PHWs help in preventing the existing users and motivating the potential population towards the dangers of tobacco use. Especially gory pictures have the effectiveness of inducing fear among the youth which can be beneficial in reducing tobacco prevalence in the long run. Fear emerging from gory pictures is associated with tobacco prevention and quitting behaviour as validated by this study. Hence, PHWs can be used as a tool in generating tobacco awareness among the young population in deterring any future smoking/tobacco related habits.

Larger PHWs covering front area are more effective than smaller PHWs. The findings revealed that the print quality of the PHWs was not good and not up to mark. The pictures were found to be dull, faded colour and washed out images. Some students suggested that they were not at all clear and not having good resolution. This suggests that serious actions need to be initiated towards ensuring that the quality of PHWs on all tobacco products are at its best and with given specification. Strict enforcement has to be carried out to ensure that the PHWs are not distorted in any manner.

Gaps and Future Directions

There is a need for conducting research studies on the perceived effectiveness of PHWs as a deterrent to smoking intention and as a stimulant of tobacco cessation behaviour among the smokers, non-smokers and smokeless tobacco products users. Given that India is battling a high rise in oral cancers, there is a need to assess whether any change in graphics is required especially for smokeless tobacco products. The lower percentage of thought of quitting in the last 30 days due to PHWs could be due to the fact that one gets used to seeing the same picture and it does not have the same effect on the viewer over time. Hence, rotation of health warnings becomes necessary over a period of time. Also small size of SLT packages and cylindrical shape of bidi packages may have a role in decreasing the effectiveness of PHWs. Studies also need to be conducted whether the PHWs are meeting the requisite standards with respect to resolutions fixed under the law. This aspect is more important as many SLT products have very poor quality of PHWs.

Further, relationship of PHWs and quit rates needs to be studied. Alongside the PHWs, there is a need to conduct study on the effectiveness of mentioning the Quitline number on the packages.

Limitations

Being a cross-sectional study, the study lacked temporality and moreover, due to time constraint of data collection, the sample size was restricted. As the sample size is small and very less percentage of students reported using tobacco in any form (n=51), it is to state that the results be generalized with caution.

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दिल्ली में स्नातक छात्रों के बीच तंबाकू उत्पादों पर सचित्र स्वास्थ्य चेतावनी के बारे में ज्ञान एवं धारणाओं का आकलन करने के बारे में अध्ययन

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सारांश

विश्व स्वास्थ्य संगठन के अनुसार, प्रत्येक वर्ष विश्व स्तर पर तंबाकू का सेवन करने के कारण 7 मिलियन लोगों की मृत्यू हो जाती है। गेट्स 2 के अनुसार, चूंकि भारत में बड़ी जनसंख्या में लोग तंबाकू का सेवन करते है, इसलिए नए प्रयोक्ताओं को रोकने के लिए सामान्य जनता पर ध्यान देना बहुत महत्वपूर्ण हो जाता है। तंबाकू उत्पाद पैकेजों पर स्वास्थ्य चेतावनी लेबल स्वास्थ्य जोखिमों के बारे में जागरूकता पैदा करने में तम्बाक उपयोगकर्ताओं तथा गैर–उपयोगकर्ताओं दोनों के बीच सबसे अधिक प्रभावी तरीके के रूप में स्थापित किया गया है। दिल्ली के 221 स्नातक छात्रों के बीच एक वर्णनात्मक क्रॉस–अनुभागीय अध्ययन आयोजित किया गया। 221 तंबाकू उपयोगकर्ताओं तथा गैर–उपयोगकर्ताओं से एक प्रश्नावली का उपयोग करके प्राथमिक आंकड़े एकत्र किए गए थे। अध्ययन से पता चला है कि 94.6 प्रतिशत छात्रों ने सिगरेट के पैकेजों , 51.1 प्रतिशत ने बीडी पैकेजों तथा 71.1 प्रतिषत ने धुआ–रहित पैकेजों की चित्रात्मक स्वास्थ्य चेतावनी (पीएचडबल्यू) पर उनका ध्यान गया है। यद्यपि, 52.9 प्रतिशत उपयोगकर्ताओं ने कभी भी चित्रित स्वास्थ्य चेतावनी के कारण तंबाकू सेवन त्यागने के बारे में सोचा। आंकड़े संग्रह के अंतिम 30 दिनों में (39.5) सिगरेट धूम्रपान करने वालों ने, (27.3) बीड़ी उपयोगकर्ताओं ने और धुएं वाला तम्बाकू सेवन (50:) करने वालों ने धूम्रपान त्यागने की बात सोची थी। समग्र रूप से, 71.9 फीसदी छात्रों को महिमा मंडित चित्र डरावनी लगी जिससे चित्रात्मक स्वास्थ्य चेतावनी तंबाकू उपयोगकर्ताओं के बीच धुम्रपान छोडने वाले अग्रणी विचारों पर प्रभाव डालती थीं। जबकि, 62.7 प्रतिशत उपयोगकर्ताओं को पता था कि वर्तमान में अंकित स्वाख्थ्य चेतावनी का प्रयोग किया जाता है, इनमें से केवल 39.2 प्रतिशत ही तम्बाकू पैकेजों पर इसके सही स्थान से अवगत थे। चित्रात्मक स्वास्थ्य चेतावनी गैर–उपयोगकर्ताओं के बीच तंबाकू के उपयोग को रोकने तथा उपयोगकर्ताओं के बीच छोडने के लिए प्रेरित करने में भूमिका निभाते है। युवावस्था वह समय है जब व्यक्ति को स्वास्थ्य जोखिमपूर्ण व्यवहारों को रोका जा सकता है तथा एक स्वस्थ, तंबाकू–मुक्त राष्ट्र की दिशा में कार्य करने के लिए प्रेरित किया जा सकता है। अध्ययन से पता चला कि छात्रों के एक बड़े हिस्से ने तंबाकू के पैकेजों पर अंकित स्वास्थ्य चेतावनी को देखा था। कई छात्रों ने पैक पर अंकित स्वास्थ्य चेतावनी को देखकर तंबाकू त्यागने के बारे में सोचा। चित्रात्मक / अंकित स्वास्थ्य चेतावनी तम्बाकू के उपयोग के संभावित स्वास्थ्य खतरों के बारे में युवाओं तथा आम जनता को शिक्षित और प्रेरित करने के एक सशक्त साधन के रूप में कार्य करता है। महिमा मंडित तथा अच्छी गुणवत्ता वाले चित्रात्मक स्वास्थ्य चेतावनी उपयोगकर्ताओं के बीच तंबाकू के उपयोग को त्यागने और गैर–उपयोगकर्ताओं के बीच पुरूष न करने के निश्चय में सफल रहे हैं। धूम्रपान करने के उद्देश्य से और तम्बाकू उपयोगकर्ताओं (धूम्रपान करने वालों, धूम्रपान न करने वाले और धूम्रपान करने वाले तंबाकू उत्पादों) को तंबाकू उपयोग के खतरों के बारे में संवेदनशील करने वाले उत्तेजक के रूप में सचित्र स्वास्थ्य चेतावनियों की कथित प्रभावशीलता पर शोध करने की आवश्यकता है।

मुख्य शब्द : चित्रात्मक स्वास्थ्य चेतावनी, तंबाकू, ज्ञान, दृष्टिकोण, स्नातक छात्र, चेतावनी लेबल

Relationship between Body Mass Index and Musculoskeletal Disorders among Women Cultivators

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Abstract

Musculoskeletal disorders (MSDs) represent as a major public health problem among working individuals. Overweight/obesity is an important independent risk factor for MSDs. Therefore, a cross-sectional study was undertaken to investigate the relationship between body mass index (BMI) and MSDs among the women cultivators. Anthropometric measures were taken in 407 participants using standard protocols and BMI was calculated. MSD was assessed with the modified Nordic Questionnaire technique. The relationship between BMI and MSDs was analyzed with logistic regression. It was seen that 33.66 per cent of the participants were underweight while 11.3 per cent of them were overweight/obese. The overweight/obese participants had significantly higher prevalence of MSDs in neck, shoulder, back and hip regions compared with their normal BMI counterparts. The underweight group had also a significant higher prevalence of MSDs in neck region than the normal weight group. Both overweight/obese and underweight participants were more likely to have MSDs as compared to their normal-weight counterparts. The present study highlights the facts that the prevalence of MSDs was high in both underweight and overweight/obese groups as compared to the normal weight women. This indicated that an U-shaped association exists between BMI and MSDs. Furthermore, the association was found to be stronger for overweight/obese individuals as compared to those underweight.

Key words: Body Mass Index, Cultivator, Musculoskeletal disorders, Overweight, Underweight.

Musculoskeletal disorders (MSDs) are defined as a group of injuries that affect the musculoskeletal system including nerves, tendon sheaths and related to bones, muscles and supporting structures such as inter-vertebral discs¹. MSDs develop gradually over a period of week, months or even years due to repeated exertions and movements of the body. Work-related MSDs belong to a collection of health problems that are more prevalent among the working class than the general population². Work-related MSDs constitute an important occupational health problem for both developed and developing countries, with rising costs of wage compensation and medical expenses, reduced productivity and lower quality of life^{3,4}. Christensen et al.⁵ stated that MSDs related to work are a major cause of disability amongst the working individuals.

The origin of MSDs is complex and multi-factorial. Many factors such as heavy lifting⁶, high job demands^{7,8}, awkward postures^{9,10}, prolonged work activity¹¹ etc. have already been identified that cause of work related MSDs. Ergonomic workstation helps in the reduction of work related MSDs and stress as well as throws an opportunity to have a better work performance for better and faster production. However, another factor is the body mass index (BMI), which influences the MSDs even in a developed ergonomic set-up. Overweight and obesity are one of the world's most challenging public health problems¹². Overweight and obesity are well

documented to be associated with major chronic illnesses, including diabetes, hypertension, heart diseases, arthritis, cancer, and all cause mortality^{5,13-15}. Overweight/obesity has also been shown to increase the risk for musculoskeletal pain¹⁶⁻¹⁸. Obesity is associated with negative consequences amongst working populations including more frequent absenteeism, workplace injury and higher health care costs¹³.

It is generally believed that there is a relation between obesity and musculoskeletal disorders. However, scientific evidence of this relation remains unclear. The Centre for Disease Control (CDC) reported that in the United States, more than 31 per cent of obese adults consulted a doctor for the diagnosis of arthritis as compared to only 16 per cent of non-obese people¹⁹. Han et al.²⁰ reported that a high waist : hip ratio was significantly associated with lower back pain. Several researchers showed that high BMI is an independent risk factor for the development of MSDs^{5,21,22}. The nature and extent of the impact of obesity on the musculoskeletal system is not well appreciated. The chronic pain and disability associated with musculoskeletal conditions not only significantly affect an individual's quality of life but often result in the early uptake of a sedentary lifestyle associated with various serious co-morbidities. Therefore, a cross-sectional study was undertaken to investigate the association between BMI and MSDs at different body regions among the female cultivators.

Methodology

Study Design: This cross-sectional descriptive study was conducted among 663 women participants engaged in different works of rice and potato cultivation. The respondents were selected from different villages of various districts of West Bengal state, India. The eligibility criteria of the respondents for inclusion in the study were: aged 18 - 50 years, apparently healthy individuals, not suffering from any acute illness and who were self-satisfied with their normal day-to-day work schedule at the time of measurements. Individuals with background of heart disease, chronic hypertension, diabetes mellitus, respiratory diseases or accident affecting musculoskeletal system were excluded from the study. Pregnant and lactating women were also excluded from the study. During the field visits, the protocol of the study was explained verbally in local language (Bengali). Written and signed consent was obtained from the women participants. Ethical approval and prior permission was obtained from the Institutional Ethics Committee before commencement of the study and the study was performed in accordance with the ethical standards of the committee and with the Helsinki Declaration. During the field visits, a survey was conducted to gather information on experience of the work on the basis of a questionnaire.

Anthropometry Measures: Anthropometric measurements and skin fold thickness of the study participants were taken following the standard technique and appropriate landmarks. The equipment consisted of an anthropometer (Hindustan Minerals), skin fold caliper (Holtain) and portable weighing machine (Libra). From the measures of height and weight of the participants, BMI was computed and from the skin fold data, total body fat and lean body weight were determined by calculating body density²³ and percentage of body fat²⁴.

 $BMI = Weight (kg) / Height^2 (meter)$

Body density (gm/cc) = 1.0994921 - 0.0009929 (Sum of triceps, suprailiac and thigh skin folds) + 0.0000023 (sum of the same three skin folds)² - 0.0001392 (Age in years).

Fat percentage (fat %) = $\{(4.95 \div Body density) - 4.5\} \times 100$

Total weight of fat (TWF) = (Weight in kg \times fat percentage) \div 100

Lean body weight (LBM) = Total weight (kg) – Total weight of fat (kg).

Musculoskeletal Disorder: MSD of the participants was evaluated by the modified Nordic questionnaire technique²⁵. The questionnaire emphasized their individual details, type of work and the occurrence or frequency of pain felt in different parts of their bodies.

Statistical Analysis: Descriptive characteristics of the participants were presented as means \pm standard deviation and percentages. χ^2 test was performed to compare the groups for categorical variables. The association of BMI with MSDs was analyzed with logistic regression after adjusting age, work experience and work categories; and expressed by the Odd Ratio (OR) and its 95 per cent confidence interval (CI). In the categorical analyses involving BMI, the interval 18.5-24.9 kg/m² was considered as the reference group. The data were analyzed for statistical significance by using the statistical package of social science (SPSS 20.0) software. A *p* value below 0.05 was denoted as significant.

Findings

The physical characteristics and experience of the work of the participants has been shown in Table 1. Before the follow-up, complete information on the experience of work was noted on the basis of a questionnaire. Results show that about 36.13 per cent of the workers had a work experience of \leq 5 years, 46.45 per cent had a work experience of 6 - 15 years and 17.42 per cent had a work experience of at least 16 years.

| Parameters | Mean ± SD | Range |
|----------------------------|-------------------|-------------|
| Age (years) | 38.33 ±13.09 | 18-50 |
| Height (cm) | 151.25 ±6.43 | 133.8-164.5 |
| Weight (Kg) | 44.17 ± 10.01 | 29.5-76.0 |
| BMI (Kg/m ²) | 19.23 ±3.7 | 13.70-33.15 |
| Thigh skin fold (mm) | 17.118.96± | 5.4-37.4 |
| Triceps skin fold (mm) | 14.618.91± | 3.6-35.2 |
| Supra-iliac skin fold (mm) | 14.238.73± | 3.2-34.8 |
| Body density (gm/cc.) | 1.05±0.02 | 1.01-1.08 |
| Body fat percentage (BF %) | 19.388.67± | 8.13-38.74 |
| Total body fat (Kg) | 9.25±٦,٢٤ | 2.41-28.46 |
| Lean body mass (kg) | 34.914.82± | 24.59-55.57 |
| Experience (Years) | 13.83±10.43 | 1-35 |

 Table 1

 The Physical Characteristics and Work Experience of Women Cultivators

Nutritional status of the participants was assessed from their BMI value. Based on the BMI cut-off value²⁶, the participants were subdivided into three nutritional categories viz., underweight, normal and overweight/obese. It was found that 33.66 per cent of the respondents were underweight. About 55 per cent of them were normal while 11.3 per cent of them were overweight/obese.

The prevalence of MSDs among the women across different BMI categories was studied and it was found that the prevalence of MSDs in different body segments was low in the normal group as compared to the underweight and overweight/obese groups (Table 2). As depicted in Table 2, the overweight/obese participants had a significantly higher prevalence of MSD at neck (p<0.01), shoulder (p<0.05), upper back (p<0.05), lower back (p<0.05) and hip (p<0.05) regions compared with their normal BMI counterparts. Underweight group also had a significant higher prevalence of MSD at neck (p<0.05) than the normal weight group.

| Body Segment | Underweight (BMI<18.5 kg/m ²) | Normal (BMI 18.5 – 24.99 kg/m²) | Overweight/Obese (BMI ≥25 kg/m²) |
|-----------------|--|------------------------------------|-------------------------------------|
| Neck | 79 (57.66%)* | 104 (46.43%) | 31 (67.39%)** |
| Shoulder | 104 (75.91%)* | 147 (65.63%) | 37 (80.43%)* |
| Elbow | 94 (68.61%) | 132 (58.93%) | 29 (63.04%) |
| Wrist | 91 (66.42%) | 141 (62.95%) | 35 (76.09%) |
| Upper Back | 88 (64.23%) | 136 (60.71%) | 35 (76.09%)* |
| Lower Back | 126 (91.97%) | 197 (87.95%) | 45 (97.83%)* |
| Hip | 91 (66.42%) | 135 (60.27%) | 35 (76.09%)* |
| Knee | 69 (50.36%) | 91 (40.63%) | 24 (52.17%) |
| Feet | 50 (36.5%) | 86 (38.39%) | 19 (41.3%) |

| Table 2 |
|---|
| Prevalence of Musculoskeletal Disorders across BMI Categories |

Normal *p<0.05; **p<0.01

The impact of BMI on the prevalence of MSDs is presented in Table 3. Logistic regression analysis showed that both overweight/obese and underweight participants were more likely to have MSDs as compared to their normal-weight counterparts. The Odd Ratio of neck discomfort of overweight/obese and underweight groups were 2.38 (95% CI: 1.22-4.66; p<0.01) and 1.57 (95% CI: 1.02-2.41; p<0.05) compared to the normal weight (OR = 1.00). The Odd Ratio of shoulder, upper back, lower back and hip discomforts of overweight/obese group were 2.15 (95% CI: 0.99-4.69), 2.06 (95% CI: 0.99-4.27), 6.17 (95% CI: 0.82-46.59) and 2.09 (95% CI: 1.01-4.35) as compared to the normal-weight (OR = 1.00). The smallest association between BMI and Musculoskeletal Disorders was found in the respondents of the underweight category while it was found to be the highest in the respondents of overweight/obese category. For both overweight/obese and underweight groups, multinomial logistic regression analysis demonstrated that even after controlling the effect of age, work experience and occupation; BMI had a significant impact on MSDs.

| Body Segment | Underweight (BMI: <18.5 kg/m²) | | Overweight/Obese (BMI: ≥25 kg/m²) | |
|-----------------|-----------------------------------|-------------------|--------------------------------------|-------------------|
| | Unadjusted | Adjusted# | Unadjusted | Adjusted# |
| Neck | 1.57 (1.02-2.41)* | 1.58 (0.98-2.55) | 2.38 (1.22-4.66)** | 2.03 (0.99-4.19) |
| Shoulder | 1.65 (1.02-2.66)* | 1.85 (1.08-3.16)* | 2.15 (0.99-4.69) | 2.4 (1.05-5.49)* |
| Elbow | 1.52 (0.97-2.38) | 1.52 (0.92-2.51) | 1.19 (0.62-2.29) | 1.17 (0.57-2.38) |
| Wrist | 1.16 (0.74-1.82) | 1.17 (0.71-1.94) | 1.87 (0.9-3.88) | 1.63 (0.74-3.6) |
| Upper Back | 1.16 (0.75-1.8) | 1.04 (0.64-1.7) | 2.06 (0.99-4.27) | 2.16 (0.99-4.66)* |
| Lower Back | 1.57 (0.75-3.28) | 1.36 (0.61-3.04) | 6.17 (0.82-46.59) | 6.29 (0.8-49.4) |
| Нір | 1.3 (0.84-2.03) | 1.41 (0.85-2.36) | 2.09 (1.01-4.35) | 1.83 (0.82-4.1) |
| Knee | 1.48 (0.97-2.27) | 1.76 (1.07-2.91)* | 1.59 (0.84-3.01) | 1.61 (0.78-3.31) |
| Feet | 0.92 (0.59-1.43) | 0.76 (0.45-1.28) | 1.13 (0.59-2.15) | 1.01 (0.48-2.1) |

 Table 3

 Cross-sectional Associations between BMI and Musculoskeletal Disorders

*p<0.05; **p<0.01

Data are presented as Odd Ratio (95% confidence interval), with normal weight as reference category # after adjusting age, work experience, occupation

Discussions

Obesity has become a major health problem due to its increasing prevalence, and associated morbidity and mortality²⁷. The global burden of obesity is rising at an alarming rate. The World Health Organization estimates that more than one billion people are overweight and of these, 300 million are obese²⁸. Overweight or obesity has a strong relationship with diabetes and cardio-vascular diseases like hypertension, coronary heart disease, etc.^{15,29,30} Despite the associations between obesity and heart disease, diabetes and other chronic diseases; elevated BMI is considered a risk factor for MSDs ^{31,32}. Overweight or obesity has been implicated in the development or progression of a wide variety of MSDs. According to Wright et al.³¹, and Stone and Broderick³², overweight/obese individuals were more likely to suffer from chronic widespread pain. The nature and extent of the impact of obesity on the musculoskeletal disorders is not well for the individuals. However, there are no widely reference levels in the region's diverse national groups in relation to adiposity that predict co-morbidities such as MSDs. This lack of useful epidemiological data is the reason why the researchers attempted to investigate the association between BMI and MSDs amongst the female cultivators.

The present study highlights the facts that the prevalence of MSDs was high in both underweight and overweight/obese groups as compared to normal-weight women. This indicated the U-shaped relation between BMI and MSDs. Several studies observed a positive association between BMI and increased risk of MSDs^{16,17}. Bihari et al.¹⁸ stated that the risk of MSDs amongst the overweight/obese individuals was 1.7 times higher than the non-overweight participants. Fransen et al.³³ reported that obesity was a significant, independent determinant of lower back pain. Excessive body weight has also been found to increase the risk for musculoskeletal pain^{16,34}. While the results of the current research demonstrate a link between BMI and MSDs amongst the study participants, indicating both underweight and overweight/ obese as a potential causes of MSDs; however, the cross-sectional design has limitations to rule out alternative explanations. One such explanation may be that obesity may increase the risk of lower back pain, for example, because of lumbar disc disorders through mechanical load^{35,36}. Increased mechanical load across the joints are likely to play a larger role in the relationship between a high BMI and weight-bearing joints. For carpal tunnel syndrome (CTS), an increase in upper extremity musculoskeletal symptoms associated with obesity has been attributed to increased adipose tissue in the carpal tunnel, causing median nerve compression^{37,38}. Adams and Roughley³⁹ stated in their study that mechanical load is the principal factor for initiating the degenerative process in the lumbar spine. In addition to mechanical load, obesity may cause lower back pain through low-grade systemic inflammation^{35,36}. Rosen and Spiegelman⁴⁰ and Shiri et al.⁴¹ reported that adipose tissue produces adipokines as well as pro- and antiinflammatory cytokines (e.g. tumor necrosis factor-a, interleukin-6) that increase the release of C-reactive protein. C-reactive protein is a nonspecific marker of inflammatory effects of adipose tissue. Shiri et al.⁴¹ reported that women with a normal waist circumference and high C-reactive protein level tended to more often report continuous lower back pain than those with low C-reactive protein levels. Leptin, an adipokine produced by adipose tissue, stimulates the synthesis of pro-inflammatory cytokines and nitric oxide; that is, it is directly linked to pain modulation. Kutlu et al.⁴² implies that leptin may increase pain sensitivity.

It is also interesting to note that the underweight women had a significant association between BMI and MSDs. There was ample evidence showing a strong association between overweight/ obesity and MSDs¹⁶⁻¹⁸; however, the present study showed that low BMI or underweight is an independent risk factor for the development of MSDs. Attar⁴³ also noted in his/her study

that the risk of MSDs among underweight individuals was 2.66 times higher than the normal weight participants. It is may be due to being underweight is related to decreased muscular strength, weakness and lowered physical activity^{44,45}.

In the present study, BMI was found to be associated with musculoskeletal symptoms. This study showed that the prevalence of MSDs was high in both underweight and overweight/ obese groups. Furthermore, the association was stronger for overweight/obese individuals as compared to the underweight women. A decrease in adiposity is one of the most effective preventive measures for MSDs in the worker population. Therefore, attention should be paid on how to decrease the levels of fatness in this population before MSDs becomes another burden. This study presents an insight to the health professionals about the relationship between BMI and MSDs, to formulate well designed training and awareness programmes to avoid adiposity.

Limitations

The current study has certain limitations. In the present study, the association BMI with MSDs was controlled for several potential confounding factors, however some potential confounders such as environmental stress, psychological stress for instance stress, anxiety or depression disorders etc. were not studied, and consequently could not be controlled for. There are limitations associated with using cross sectional data, as in every cross sectional study, conclusion related to cause and effect cannot be drawn. A longitudinal dataset would be better suited to examine the relationship between BMI and MSDs. The relatively small number of participants which may have provided inadequate statistical power to detect some meaningful differences as statistically significant, along with mentioning potential inadequate control of confounding. However, as far as we are aware, this is the only provincial study to define the relationship between BMI and MSDs among the women cultivators. This study was conducted on women only. Additional study is needed on men participants.

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कृषक महिलाओं में शारीरिक द्रव्यमानक सूचकांक एवं पेशीयकंकालीय विकारों के मध्य संबंध

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सारांश

कामकाजी लोगों में पेशीयकंकालीय विकार (एमएसडी) प्रमुख स्वास्थ्य समस्या के रूप में पाया गया हैं। अत्यधिक शारीरिक वजन/स्थूलता पेशीयकंकालीय विकारों के लिए एक महत्वपूर्ण स्वतंत्र जोखिम घटक है। अतः कृशक महिलाओं में शारीरिक द्रव्यमानक सूचकांक एवं पेशीयकंकालीय विकारों के मध्य संबंध का पता लगाने के लिए एक क्रॉस–अनुभागीय अध्ययन संचालित किया गया। मानक प्रोटोकॉल का उपयोग करने वाले 407 प्रतिभागियों में एंथ्रोपोमेट्रिक उपाय किए गए और बीएमआई की गणना की गई। पेशीयकंकालीय विकार का मूल्यांकन संशोधित नॉर्डिक प्रश्नावली तकनीक से किया गया था। बीएमआई और एमएसडी के बीच संबंध का विश्लेशण लॉजिस्टिक प्रतिगमन प्रणाली से किया गया था। यह देखा गया कि 33.66 प्रतिशत प्रतिभागी कम वजन के थे, जबकि 11.3 प्रतिशत शारीरिक वजन / स्थूलता से ग्रस्त थे। शारीरिक वजन / स्थूलता से ग्रस्त प्रतिभागियों में उनके सामान्य बीएमआई समकक्षों की तुलना में गर्दन, कंधे, पीठ और कूल्हे के क्षेत्रों में एमएसडी की मात्रा आधिक थी। सामान्य वजन वर्ग की तुलना में कम वजन वाले समह में गर्दन के क्षेत्र में एमएसडी की मात्रा आधिक थी। अधिक वजन / स्थूल और कम वजन वाले प्रतिभागियों में उनके सामान्य वजन वाले समकक्ष व्यक्तियों की तुलना में एमएसडी होने की अधिक संभावना थी। वर्तमान अध्ययन में इस पर प्रकाश डाला गया है कि सामान्य वजन वाली महिलाओं की तूलना में एमएसडी की व्यापकता कम वजन और अधिक वजन / स्थूलता से ग्रस्त लोगों में अधिक थी। यह इंगित करता है कि बीएमआई और एमएसडी के बीच एक यू–आकार का सह—संबंध विद्यमान है। इसके अतिरिक्त, कम वजन वाले लोगों की तुलना में अधिक वजन वाले/ स्थूल व्यक्तियों में यह संबंध दुढ पाया गया।

मुख्य शब्दः शारीरिक द्रव्यमानक सूचकांक, कृषक, पेशीयकंकालीय विकार, अत्यधिक शारीरिक वजन, कम वजन

Universal Health Coverage and Role of Health Insurance

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Abstract

Integrated healthcare at a macro level means managing the overall well-being of the nation by putting the consumer at the center; it involves delivering the required level of efficient and quality care to the consumers throughout their lifetime. Countries around the world are making progress and adopting universal health coverage system. Universal Health Coverage (UHC) is defined as a system under which a specified package of benefits has been provided to all the members of a society with the end goal of providing financial risk protection, improved access to health services, and improved health outcomes i.e. it incorporates two complementary dimensions in addition to the financial risk protection: the extent of population coverage and the extent of health service coverage. Providing quality and affordable health remains as a goal for many countries. Each country has chartered out its own policies proportion to the population covered by existing health care system in terms of range of health services to be provided and the extent of financial risk protection to the local population. The main category of universal health coverage is based on tax, finance, system and social insurance system. This review article discusses how different countries including India have planned and are being implementing various health care models. This article also explains how UHC has been undertaken in the Indian context.

Key words: Universal Health Coverage, Health services, Health Insurance.

Universal Health Coverage (UHC) as it is conceptualised today, refers to ensuring access to appropriate promotive, preventive, curative and rehabilitative health services, at an affordable cost, for all citizens of the country so that people do not suffer financial hardship while paying for them.^{1,2} UHC is one mechanism of ensuring a balanced development where the economic growth of a nation is accompanied by an increase of health and well-being of all persons. At least half of the world's population still does not have full coverage of essential health services. About 100 million people are still being pushed into extreme poverty (defined as living on 1.90 USD or less a day) because they have to pay for health care. Over 930 million people (around 12 per cent of the world's population) spend at least 10 per cent of their household budgets to pay for health care. All UN Member States have agreed to try to achieve universal health coverage (UHC) by 2030, as part of the Sustainable Development Goals.

UHC aims in protecting people from the financial hardships of paying for health services out of their own pockets reducing the risk of people being pushed to poverty because unexpected illness compels them to use up their life savings, sell assets, or borrow. This financial hardship destroys their and children's future. Hence, the countries are emphasizing on the health financing schemes supplementing UHC.

UHC is much more than just health. Taking steps towards UHC means steps towards equity,

development priorities, and social inclusion and cohesion. Many countries are already making progress towards UHC. In countries where health services have traditionally been accessible and affordable, governments are finding it increasingly difficult to respond to the ever-growing health needs of the populations and the increasing costs of health services. Moving towards UHC requires strengthening health systems in all countries. Robust financing structures are the keys.



When people have to pay most of the cost for health services out of their own pockets, the poor are often unable to obtain many of the services they need, and even the rich may be exposed to financial hardship in the event of a severe or long-term/terminal illness. Pooling funds from compulsory funding sources (such as mandatory insurance contributions) can spread the financial risks of illness across a population. The present paper reviews the Health Insurance aspect of UHC across the globe following various models of UHC. The emergence of UHCs has been due to several factors such as public demand; economic feasibility and political leadership have combined to move many low and middle-income countries (LMICs) towards adopting the goal of UHC. Countries like Brazil³, Thailand and Taiwan⁴ have made considerable progress in the attainment of UHC through reforms introduced in the past 2-3 decades. Others like Kenya are in the process of introducing nation-wide social health insurance schemes which aim to grant all population groups access to comprehensive benefit packages of health services⁹. This review article discusses how different countries around the globe including India have planned and are implementing various health care models with specific reference to Health Insurance.

Current Scenario: A Global Movement towards UHC

According to the International Labour Organisation, nearly 50 countries have attained universal coverage or near universal coverage in the world today. However, conspicuous gaps still exist in Asia, Africa and the Middle East⁵. Escalating health care costs, inadequate public spending, and weak health care delivery systems in low and middle income countries have been barriers to UHC. There is now a greater recognition of the need to configure health systems which ensure universal access to good health care, through adequate and sustainable financing mechanisms that allow the population wide coverage and efficient delivery of a wide range of health services^{6, 7}. The 2005 World Health Assembly (WHA) urged the member states to pursue UHC, ensuring equitable distribution of quality health care infrastructure and human resources,
based upon health-financing systems protecting against catastrophic health-care expenditure and impoverishment of individuals seeking car⁸. It also highlighted the importance of taking advantage, wherever appropriate, of opportunities that exist for collaboration between public and private providers and health-financing organizations, under strong overall government stewardship.

The 2010 World Health Report built upon the 2005 WHA recommendations and aimed at assisting countries in quickly moving towards Universal Health Coverage⁹. Different Countries have developed their own goals and strategies to meet the basic goals of health care system, treating the sick and protecting the families against financial ruin from medical bills. There are three main dimensions of UHC i.e. population, services and direct costs as depicted in the figure below.



Figure 2 Dimensions of Universal Health Care

Three dimensions to consider when moving towards universal coverage

These dimensions allocated by WHO provides a picture to show that the coverage is done mainly for

- ✓ **Population coverage:** Extend services to the population which has not yet been addressed.
- Health services coverage: Include other areas where the health facilities have not reached yet.
- ✓ **Financial coverage:** Reduce the cost sharing and fees while obtaining health services

Following are the various Models of UHC system came in existence over the years:

UHC System Models I Bismarck and Germany's Social Health Insurance System, 1883

Bismarck's innovation in 1883 was to establish several so-called "sickness funds" that had mandatory enrolment and defined benefits. These funds covered members nationally but had limitations¹⁰. Under Bismarck's leadership, the German government took a fundamental step towards UHC. Its actions solidified the previously vague principle of government involvement in private health by specifying a mechanism to guarantee financing and define benefits. These would be delivered through existing public and private facilities. Over the course of roughly

Source: adapted WHO 2015b

a century, this SHI system evolved to provide universal health coverage. Germany slowly expanded the system in two directions. Mandatory enrolment was extended piecemeal to include more and more employment categories. Germany achieved universal health coverage through this series of extensions to minimum benefit packages and expansions of the enrolled population after 105 years after Bismarck's first sickness fund laws¹¹. Bärnighausen and Sauerborn have quantified this long-term progressive increase in the proportion of the German population covered by public and private insurance. The policy covers Unlimited Family Members, Pre and Post-Hospitalization Expenses, Day Care Surgeries, Reinstatement of Sum Insured, New Born Babies and 5000+ Hospitals with Cashless Facilities¹¹.

UHC System Model II The Beveridge Report and the British National Health Service

The British National Health Service (NHS) was founded in 1948 which offered all medically indicated services to any resident without payment at the point of service. As in Germany, the means by which health care was delivered by private physicians and public hospitals predated the establishment of a national health system¹². In its moment of creation, the NHS contained innovations primarily related to its financing model. Beveridge laid out broad principles of social protection and directly precipitated the establishment of the NHS. It proposed that the whole scheme would be nationalized, and to provide protection from health-related poverty, all medical care would be free. Although politicians resisted initially, these principles were adopted largely unaltered and the NHS was established in 1948¹³.

UHC Model III The National Health Insurance Model

The National Health Insurance (NHI) Model has elements of both Beveridge and Bismarck. Like the Bismarck Model, it is insurance-based; and like Beveridge, it is single payer. It uses private-sector providers but payment comes from a government-run insurance programme that every citizen pays into. Since there's no need for marketing, no financial motive to deny claims and no profit, these universal insurance programmes tend to be cheaper and much simpler administratively than American-style for-profit insurance. Because the government is the sole payer, it can exert tremendous bargaining influence on the prices of medical services and drugs. NHI countries generally control costs by limiting the services they will pay for and by limiting the availability of certain services, thus creating the lengthy waits for non-acute secondary care. The classic NHI system is found in Canada but some newly industrialized countries like Taiwan and South Korea have also adopted the NHI model.

The models depict three types of available systems of health financing as given below.

Single Payer: The government provides insurance for all residents (or citizens) and pays all health care expenses except for co-pays and co-insurance. Providers may be public, private, or a combination of both¹⁴. Single-payer health insurance collects all medical fees, and then pays for all services, through a "single" government (or government-related) source. In wealthy nations, this kind of publicly managed insurance is typically extended to all citizens and legal residents. Examples include the United Kingdom's National Health Service, Australia's Medicare and Taiwan's National Health Insurance¹⁵.

Two-Tier: The government provides or mandates catastrophic or minimum insurance coverage for all residents (or citizens) while allowing the purchase of additional voluntary insurance or fee-for-service care when desired. In Singapore, all residents receive a catastrophic policy from the government coupled with a health savings account that they use to pay for routine care. In other countries like Ireland and Israel, the government provides a core policy which the majority of the population supplements with private insurance¹⁶.

Insurance Mandate: The government mandates that all citizens purchase insurance, whether from private, public, or non-profit insurers. In some cases, the insurer list is quite restrictive while in others, a healthy private market for insurance is simply regulated and standardized by the government. In this kind of system, insurers are barred from rejecting sick individuals and they are required to purchase insurance, in order to prevent typical health care market failures from arising.

Based on the models discussed above, different countries across the globe follow different UHC practices as elaborated below.

Sweden: Swedish healthcare is financed by government taxes, employer-paid national social insurance, out-of-pocket user fees, and private insurance. Public expenditures accounted for 85.2 per cent of healthcare services while 14.8 per cent of expenditures were private (WHO 2004). Physicians at public hospitals are employed and salaried by the county councils. Their income depends neither on the number of patients treated nor on the volume of their work.

Australia: In Australia, the public taxation-funded national health insurance scheme, Medicare, provides universal access to subsidized medical services, subsidized pharmaceuticals, and free hospital treatment as a public patient. People can also take private health insurance to complement the public scheme, in order to cover or partially cover the financial costs of hospital treatment as private patients, to enable quicker access to elective surgery as a private patient, and to cover or partially cover dental and other allied health services. Government regulations protect senior citizen, the poor, children and rural residents.

Canada: In Canada, under the UHC, most of the physicians are in private practices and are remunerated on a fee-for-service basis, though an increasing number receive alternative forms of public payment such as capitation, salary, pay-for-performance, and blended funding. Physicians are not allowed to charge patients more than what they receive under the fee schedule negotiated with the provincial or territorial health insurance plan. Hospital-based physicians generally are not hospital employees and are paid fee-for-service. Physicians in community clinics are salaried.

Sri Lanka: Sri Lanka achieved UHC while its per capita GDP was still below US\$500 annually by relying on tax-financed and government-operated health services. All in-patient, out-patient, and community health services are free to all Sri Lankans, without any user charges since 1951. Sri Lanka's health system is public hospital-dominated.

Russia and Soviet Union: The new mixed economy Russia has switched to a mixed model of health care with private financing and provision running alongside state financing and provision. Russian Prime Minister Vladimir Putin announced a new large-scale health care reform in 2011 and pledged to allocate more than 300 billion rubles (\$10 billion) in the next few years to improve health care in the country.

Thailand: Universal Coverage (UC) beneficiaries have access to free ambulatory care at registered primary-care contractor networks which is normally a district health system (DHS), consisting of sub-district health centers (HCs) and district hospitals (DHs), with a nominal payment, 30 Baht, equivalent to US\$ 0.7 per visit (with exemption for previous LIC holders) (Tangcharoensathien and Jongudomsuk, 2004; Towse et al., 2004). UC members are entitled to free hospital admissions, with hospitals paid from global budgets based on Diagnostic-Related Groups (DRGs). Beneficiaries under CSMBS (Civil Servant Medical Benefit Scheme) have access to free ambulatory and admission services, with free choice of providers that are paid by Fee-For-Service (FFS)²¹. SSS (Social Security Scheme) beneficiaries are also entitled to free ambulatory and admission services but only at registered hospitals that are paid by capitation. All three public schemes are financed from public resources⁹.

France: Health care coverage in France is universal. All residents are entitled to publicly financed health care through Statutory Health Insurance (SHI). It covers the entire population, it does not cover 100 per cent expenditures; 92 percent of the population have access to voluntary health insurance (VHI) either through their employers or via means-tested vouchers (CMU complementarian, or CMU-C).

Switzerland: In Switzerland, the entire population is insured either in one of the three types of managed care organization: health maintenance organizations (HMOs), independent practice associations (IPAs), and fee-for-service plans with gate-keeping provisions. There are two types of HMOs: staff models, in which physicians are employees; and group models, in which a physician group owns the HMO and is paid on a per capita basis. An IPA consists of a network of general practitioners who contract with an insurer and function as gatekeepers; payment is usually on a fee-for-service basis, although a few IPAs are capitated. Patients who use an in-network general practitioner often pay lower cost-sharing. HMOs are more likely to achieve savings, with estimated cost reductions ranging from 20 percent to 37 percent. IPAs show much smaller savings, usually in those organizations those capitate physicians.

United Kingdom: Coverage is universal. All those "ordinarily resident" in England are entitled to health care that is largely free at the point of use under National Health System (NHS). NHS is divided into two sections: primary and secondary care¹².

South Korea: All people in South Korea are eligible for coverage under the National Health Insurance Program. In 2006, the total number of covered people was over 47 million, which is about 96.3 per cent of the total population. The insured are divided into two groups: employee insured and self-employed insured. The "employee insured" category includes the insured person's spouse, descendants, brothers or sisters, and direct lineal ascendants. Insured employees pay 5.08 per cent of their average salary in contribution payments. Contribution rates change every year. The insured individual is required to pay a certain portion of the health care costs. The co-payments differ according to the level and type of medical care institution.

New Zealand:All New Zealand residents have universal access to a broad range of health and disability services with substantive government funding drawn from general taxes. Public hospital services are free, but patients are required to make copayments for primary care medical services. New Zealand has a mix of public and private hospitals, but public hospitals, providing all emergency and intensive care services. Private insurance exist which is used to cover cost-sharing requirements, elective surgery in private hospitals, and specialist outpatient consultations. **Italy:** Italy, as other developed European countries, has a national health service (NHS) that in principle offers universal health care and coverage through a prepaid compulsory health insurance that is managed by the central government, which is responsible for both funding and supplying services to the population (McCarthy, 1992). Recently, in the context of the efforts to control the rising costs while maintaining universal coverage, the impact of copayment has increased for diagnostics and for medicines only.

Brazil: In the year 1988, health services became universal and equitable for all citizens of Brazil according to the constitution with the establishment of the Unified Health Service (Sistema **Único** de Saúde, SUS). Under the SUS, every citizen is entitled to health care services free at the point of use provided by public and private facilities. The financing of health care under the SUS initially comprised (in addition to government budgets) mandatory contributions tied to gross revenues and net profits from companies³.

Universal Health Care in India

The High Level Expert Group on Universal Health Coverage in India, says, "Ensuring equitable access for all Indian citizens residing in any part of the country, regardless of income level, social status, gender, caste or religion; to affordable, accountable and appropriate, assured quality health services (promotive, preventive, curative and rehabilitative) delivered to individuals and populations, as well as services addressing wider determinants of health, with the government being the guarantor and enabler, although not necessarily the only provider, of health and related services."

Background: Around 600 million people fail to access the health services they need and 63 million Indians are living in poverty because of healthcare costs. As a result, India has the



second lowest life expectancy in South Asia- almost eight years lower than in China. India also did not achieve either its child or maternal mortality targets under the Millennium Development Goals (MDGs).

This situation is not only damaging the health of the Indian people, it is also a significant impediment to further social development and economic growth. The root cause of India's low health coverage is its chronically low level of public health spending which has never exceeded one per cent of GDP. In the absence of adequate public financing, households have had no choice but to pay for services directly themselves- often with disastrous consequences for family welfare. The transition towards UHC involves increasing public health spending which has the effect of "crowding out" less efficient and more inequitable private out-of-pocket health spending. This has happened in many Asian countries (for example public financing has trebled in China and Thailand in the last 20 years) but is yet to take place in India.

Rural Health Care in India: Ineffectiveness of the primary health care created a breach in referral system which should serve as an entry point for the individual and continuous comprehensive coordination at all level of health care. Utilization of services has shown to be residence and educational level dependent with 70 per cent of illiterate availing of no ANC care when compared with 15 per cent of literate with rural women (43%) less likely to receive the ANC services when compared with urban women (74%). Dearth of men power, reluctant community participation and inter-sectoral coordination make the condition nastiest

Identified Problem: Nearly 68 per cent of India's population resides in rural areas. But percentage of persons having covered under any health insurance scheme is 14.1 per cent in rural area even though majority of Indians is more vulnerable to major ailments.

Challenges Effecting Penetration of Health Insurance in Rural Area

The literacy rate in the country as a whole is 74.04 per cent. In the rural and the urban areas, the literacy rates are 68.9 per cent and 84.9 per cent respectively. Rural people's common perception about insurance is that it is not required and their more focus is on savings. Rural people have less awareness on health insurance; they have a challenge in accessing to all the health insurance product features / prices available. Several studies show that an average rural household saves about one-third of their incomes. In rural families, all the family members are financially dependent on the key earning member of the family. Hence, health insurance of the person is must. Rural areas don't have extensive network and coverage like District Co-op Banks, Co-op Societies, postal services and micro finance institutions, etc.

Health insurance means "an individual or group purchasing health care coverage in advance by paying a fee called premium". In its broader sense, Health insurance is a contract between the insurance company and the insured person to cover the medical cost that might arise from illness, accidental injuries, surgeries and other medical complications incurred by individuals and households. Health insurance in India is a growing segment of India's economy. The Indian health system is one of the largest in the world, with nearly 1.3 billion potential beneficiaries. The health industry in India has rapidly become one of the most important sectors in the country in terms of income and job creation. In 2018, ten million Indian households (500 million people) did not benefit from health coverage. In 2011, 3.9 per cent³¹ of India's gross domestic product was spent in the health sector. According to the World Health Organization (WHO), this is among the lowest of the BRICS (Brazil, Russia, India, China, and South Africa) economies. Policies are available that offer both individual and family cover. Out of this 3.9 per cent, health insurance accounts for 5-10 per cent of expenditure, employers account for around 9 per cent while personal expenditure amounts to an astounding 82 per cent³². In the year 2016, the NSSO released the report "Key Indicators of Social Consumption in India: Health" based on its 71st round of surveys. The survey carried out in the year 2014 found out that more than 80 per cent of Indians were not covered under any health insurance plan, and only 18 per cent (government funded 12%) of the urban population and 14 per cent (government funded 13%) of the rural population was covered under any form of health insurance.^[33]For the financial year 2014-'15, Health Insurance premium was 20,440 crores.

Health Insurance in India has a huge potential for expansion. Nearly 68 per cent of India's population resides in rural areas. But percentage of persons having covered under any health insurance scheme is 14.1 per cent in rural and 18.1 per cent in urban areas, Health insurance is amongst the most intricate insurance products, as it comes with numerous riders and benefits; and hence, there are so many variants to it. The insurance marketplace nationwide is quite competitive. Needless to say, it is imperative to buy the right health insurance policy as it helps you to keep up with the ever-soaring healthcare costs and assures you and your family of a healthy future without having to worry about the medical bills and hospitalization expense.

To address the health inequalities and improve health outcomes, an architectural correction in public healthcare system was made by the Ministry of Health and Family Welfare (MoHFW) through the National Rural Health Mission (NRHM) which was later redesigned as National Health Mission (NHM) to strengthen both rural and urban public health infrastructure, human resource capacity and service delivery. NHM was complemented by other key initiatives that included *Janani Suraksha Yojana* and Mission *Indradhanush. Rashtriya Swasthya Bima Yojana* (RSBY) was another innovative initiative launched by the Ministry of Labour and Employment (now with MoHFW) which provided financial risk protection to poor families through government-funded health insurance. However, in spite of all the efforts, the total health expenditures (THEs) in India remained at 4.7 per cent of gross domestic product (GDP) in 2014. The contribution of public health expenditure also remained stagnant at 30 per cent, which is one of the lowest among LMICs.

Healthcare need is not only uncertain and unpredictable but also catastrophic to families living on the margins. Poor and vulnerable families not only spend money out-of-pocket (OOP) due to ill health but also have to suffer wage loss to seek healthcare. Estimates suggest that in India, around 50 million households fall in poverty annually on account of OOP healthcare expenditures³⁰. One of the reasons for high rate of Out Of Pocket expenditures is limited access to healthcare in public sector which compels patients to seek care from the private sector.

Evidence suggests that a dynamic interaction between three factors forces patients towards private sector in India: (*i*) healthcare provisioning dominated by private sector, (*ii*) high share of private expenditure as compared to public expenditure in THE, and (*iii*) scarcity of public services on account of deteriorated public health sector. For example, private sector accounted for 75 per cent of total outpatient visits and 62 per cent of total inpatient visits in India in 2014 and the contribution of Out of Pocket payments as per cent of THE was 61 per cent in 2012. Given such a scenario, it is desirable to move towards UHC-based health system where complex and dynamic private sector is efficiently regulated; and market competition and choices are used as tools to enhance quality of care and reduce cost of care.

In addition, a healthcare consultation (OPD) unleashes additional demands for health such as care for co-morbidities and patient support services, and many of these services are not covered as part of health insurance. Hence, possibility of increase in households OOP expenditure

cannot be ruled out with increased access because the product that is offered under AB-NHPM is geared towards secondary and tertiary inpatient care over comprehensive outpatient care. Learning from our experiences of RSBY scheme, the benefit package to the beneficiaries should be designed appropriately by keeping in account their social and economic context and their healthcare needs.

Out-of-pocket medical expenses account for 62 per cent of all healthcare costs in India. So, there is a need for plans that take care of outpatient department (OPD) expenses. However, OPD products have so far failed to become popular due to various reasons. They are seen as tax-maximizing tools where the additional bills served to exhaust the Section 80D limits on health premiums paid. Moreover, determining the authenticity of bills was a concern, making the claim settlement process tedious. The OPD benefits come in several shapes and sizes. Figure 3 depicts the types of available Health Insurances in India.



Figure 3 Types of Health Insurance in India

Social Health Insurance Plans

The following are the various programmes launched from time to time to support UHC through Health financing:

The *Rashtriya Swasthya Bima Yojana* (**RSBY**), a Central Government health insurance scheme for Below Poverty Line families, was launched in 2007-'08 and it became fully operational on 1 April 2008. At its peak, the scheme was operational across 25 states of India covering 41,331,0733 households. Moreover, the currently State-run health insurance schemes in Andhra Pradesh and Tamil Nadu have managed to cover as much as 50-80 per cent of their population under the health insurance umbrella. Further, States like Himachal Pradesh and Kerala are trying to deepen the benefits of packages for their poor and vulnerable strata. There are some States who are on the path of UHC such as Meghalaya with its Megha Health Insurance and Goa with its Deen Dayal *Swasthya Seva Yojana* to provide health insurance coverage for the entire resident population of the State.

Ayushman Bharat- National Health Protection Mission: To translate its vision of the NHP-2017 into a reality, the Government of India has approved Centrally Sponsored *Ayushman Bharat*-National Health Protection Mission (AB-NHPM). Socio-Economic Caste Census (SECC) database shall be used to identify target beneficiaries of the proposed scheme. AB-NHPM suggests that the scheme is expected to have major impact on reduction of OOP expenditure on grounds of (A) increased benefit cover to nearly 40 per cent of the population (poorest and vulnerable), (*B*) covering almost all secondary and many tertiary hospitalizations (except a negative list), and (*C*) coverage of 5 lakhs for each family (no restriction of family size)". It's an insurance scheme seeks to provide a health cover of up to Rs. 5 lakh per family per year for secondary and tertiary care hospitalization to over 10.74 crore vulnerable families. It provides a cashless and paperless access to services for beneficiary at the point of service. Since its launch under PMJAY, more than 15,000 hospitals and health care providers have been empanelled across the country and around 26 lakh people have availed of treatment so far in several hospitals across the country.



Source-https://sarkariniti.com/ayushman-bharat-ab-nhpm-benefits-registration-pdf/

Pradhan Mantri Jan Arogya Yojana (PM-JAY), the world's largest fully government-funded health insurance scheme was launched on 23 September 2018 for providing coverage to nearly 10.74 crore poor families of the country identified as per the Socio-Economic Caste Census Survey-2011. The objectives of the scheme include reducing catastrophic out-of-pocket health expenditure; improved access to the population for hospitalisation care. PM-JAY provides a cashless cover of up to Rs. 5, 00,000/- on a family floater basis which means that it can be used by one or all members of the family. The PM-JAY initiative is addressing health (covering prevention, promotion and ambulatory care) at the secondary and tertiary levels, and aiming to cover around 40 per cent the poor and vulnerable population of the country (50 crore beneficiaries). PM-JAY is completely funded by the Government and costs are shared between Central and State Governments. One of the biggest strengths of PM-JAY is its flexible design which considers the federal nature of the country where health is constitutionally a "State subject". The scheme gives the freedom to the States in deciding the mode of implementation which is contextually appropriate. Evidence suggests that not only hospitalization but also outpatient care leads to impoverishment of households. For families living on daily wages, hospitalization probably is the last resort in an illness episode as it not only leads to catastrophic expenses but also to loss of wages of more than one earning member of the family³⁷.

Aam Aadmi Bima Yojana (AABY): *Aam Admi Bima Yojana*, a Social Security Scheme for rural landless household was launched on 2 October 2007. The head of the family or one earning member in the family of such a household is covered under the scheme. The premium of Rs. 200/- per person per annum is shared equally by the Central Government and the State Government. The member to be covered should be aged between 18 and 59 years. On natural death, Rs. 30,000/-; on death due to accident / on permanent disability due to accident (loss of 2 eyes or 2 limbs) Rs. 75,000/-; on partial permanent disability due to accident (loss of one eye or one limb) Rs. 37,500/-.

Janashree Bima Yojana (JBY): JBY was launched on 10 August 2000. The Scheme replaced Social Security Group Insurance Scheme (SSGIS) and Rural Group Life Insurance Scheme (RGLIS). 45 occupational groups have been covered under this scheme.

Universal Health Insurance Scheme (UHIS): There is some public sector general insurance companies have been implementing Universal Health Insurance Scheme for improving the access of health care to poor families. The scheme provides for reimbursement of medical expenses up to Rs.30,000/- towards hospitalization floated amongst the entire family, death cover due to an accident @ Rs.25,000/- to the earning head of the family and compensation due to loss of earning of the earning member @ Rs.50/- per day up to maximum of 15 days. The Universal Health Insurance Scheme (UHIS) has been redesigned targeting only the BPL families. The premium subsidy has been enhanced from Rs.100 to Rs.200 for an individual, Rs.300 for a family of five and Rs.400 for a family of seven, without any reduction in benefits.

Aarogyasri: Aarogyasri is a programme of the Government of Andhra Pradesh (United AP). It covers those below the poverty line. The government issues an *Aarogyasri* card and the beneficiary can use it at government and private hospitals to obtain services free of cost. Local Agents, Doctors and Community Health Workers need to educate and aware rural people on the need of health insurance which may surely create trust on this insurance scheme.

Private Health Insurance Scheme

Health insurance industry in India is one of the fastest growing segments with more and more private companies venturing into the sector, the situation may change soon. Mediclaim is one of the few private insurance schemes available in India. this was introduced in 1986, a voluntary health insurance scheme offered by the public sector, (and since 1999 the private sector) health insurance companies. Anybody (3 months to 80 years) who can afford the risk-rated premium is eligible to join the scheme. The premium depends on the age, risk and the benefit package opted for. The subscribers are usually the middle and upper class, especially as there is a tax benefit in subscribing it.

Insurance Regulatory Development Authority (IRDA): A regulatory body, controlled by the Indian Government, governing insurance companies across India. The headquarters of IRDA is located at Hyderabad which aims to protect the interests of the policyholders, and to regulate, promote and ensure orderly growth of the insurance industry.

Third Party Administrator (TPA): A TPA is a specialized health service provider, introduced by the IRDA, rendering the following broad-spectrum services

- Networking with hospitals
- Facilitating hospitalization processes
- Claim processing and settlement

Community-based Health Insurance Scheme

There is an increasing inclination among multinational agencies including the World Bank, World Health Organization and International Labour Organization to advocate communitybased health insurance (CBHI) schemes as part of a comprehensive solution to improve access for healthcare services in India. Community health insurance is "any not-for-profit insurance scheme aimed primarily at the informal sector and formed on the basis of a collective pooling of health risks, and in which the members participate in its management." While the CHI movement is vibrant in Africa, it is slowly picking up momentum in India³⁹.

Characteristics of Community Health Insurance in India

Initiated by NGOs / CBOs, it is mainly aimed at improving access to health care. The members varies from 1000+ to more than 2 million. There are three basic Models of CHI-

- Provider (Direct)model- Hospital Community
- Insurer (Mutual) model- NGO Hospital Community
- Linked model- NGO Hospital Community

Yeshasvini: Organized by the Yeshasvini Trust, Karnataka; this is meant for the cooperative farmers and their families. The premium is of Rs 120 + 30 per person per year. The beneficiary is able to undergo any surgery costing up to Rs. 1 lakh per hospitalization and Rs. 2 lakh per patient per year. As far as providers are concerned, empanelled hospitals are more than 300 and it's administration is governed by TPAs.

Karuna Trust: Initiated in September 2002, Organized by Karuna Trust, Karnataka; it benefits the BPL families in talukas where Karuna trust works. The premium is of Rs. 20/- per person per year. The benefit towards hospitalization expenses is upto Rs. 2500/-; loss of wages upto Rs. 1500/-; payment to the doctor's up to Rs. 1500/-. The providers are only government hospitals.

Performance of Community Health Insurance

The CHIs reach out to the weaker sections of society and provide some form of health security by improving access to health care. The schemes have protected households but only partially. Hence, these schemes have not improved quality of care for the patients and many of them require external subsidies. Hence, it is a useful tool to improve access to health care and protect families from impoverishment. But there are some pre-conditions that need to be met as trustworthy organization, good quality providers, community with some means and managerial skills

Conclusion

Following others is easy but providing a novel and meaningful solution to the problems is

innovation. It endows resources with new capacity to enhance performance and create growth. Various countries are following different mechanism i.e. Universal Declaration of Human Rights states, "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, medical care and necessary social services." Universal Health Coverage (UHC) as it is conceptualised today, refers to ensuring access, for all citizens of the country to appropriate promotive, preventive, curative and rehabilitative health services at an affordable cost. This helps people do not suffer financial hardship while paying for them. UHC is one mechanism of ensuring balanced development where the economic growth of a nation is accompanied by an increase which is parallel with an increase in the health and well being of all people. Globally, the agenda of UHC is currently taking centre stage in health policy. The advancement of UHC in India shows a steady evolution. The vital initiatives for enhancing UHC in India range from promoting budgetary outlay, creating new public health resources and the application of ICT for bridging the gap in healthcare for the unreached, and promoting efficient allocation and utilization of our limited health resources.

However, in India, if the government decides to go for insurance-driven financing mechanism for healthcare services because of strategic reasons such as developing healthcare market or utilizing strengths of the existing private sector, a cautious approach is warranted to prevent regulatory capture. As a way forward, it is suggested to strengthen regulatory framework and institutions (such as Insurance Regulator and Development Authority and Competition Commission of India) and public health facilities to ensure competition and choice in the healthcare market. It is also suggested to have synergy between AB-NHPM, and Health and Wellness Centers as a desirable goal. This would ensure complementarily between secondary and tertiary care services covered through AB-NHPM with comprehensive primary care from Health and Wellness Centers. This would also prevent demand-side moral hazard and healthcare cost escalation.

The advancement of UHC in India shows a steady evolution. The vital initiatives for enhancing UHC in India range from promoting budgetary outlay, creating new public health resources and the application of ICT for bridging the gap in healthcare for the unreached, and promoting efficient allocation and utilization of our limited health resources. Further, sustainable development regarding universal access to good education, sanitation, clean energy, safe environmental and sound infrastructure which are essential for realizing and maintaining a state of good health is in a state of acceleration. Nevertheless, the challenges of scaling up such developmental initiatives to reach the proverbial "last man" in the remotest corner of India in fulfillment of Mahatma Gandhi's vision continues to endure. Like other countries, India is striving towards United Nations Sustainable Development Goals to achieve UHC by 2030, and also aligning them with the country's National Health Policy (NHP) 2017.

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सार्वभौमिक स्वास्थ्य कवरेज तथा स्वास्थ्य बीमा की भूमिका

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सारांश

वृहद रूप में पर एकीकृत स्वास्थ्य सेवा का तात्पर्य है, उपभोक्ता को केंद्र में रखकर राष्ट्र के समग्र कल्याण के लिए प्रबंधन करना; इसके अंतर्गत उन्हें अपने पूरे जीवनकाल में उपभोक्ताओं को कुषल और गुणवत्तापूर्ण देखभाल के लिए आवश्यक उपलब्ध कराने होते है। दुनिया भर के देश प्रगति कर रहे हैं और सार्वभौमिक स्वास्थ्य कवरेज प्रणाली को अपना भी रहे हैं। सार्वभौमिक स्वास्थ्य कवरेज (यूएचसी) को एक प्रणाली के रूप में परिभाषित किया गया है, जिसके अंतर्गत समाज के सभी सदस्यों को वित्तीय जोखिम सुरक्षा प्रदान करने, स्वास्थ्य सेवाओं तक बेहतर सुलभता और स्वास्थ्य परिणामों में सुधार के लक्ष्य के साथ एक निर्दिष्ट पैकेज प्रदान किया गया है। वित्तीय जोखिम संरक्षण के अतिरिक्त दो पूरक आयाम शामिल हैं: जनसंख्या कवरेज की सीमा तथा स्वास्थ्य सेवा कवरेज की सीमा। कई देशों के लिए गुणवत्ता एवं वहनीय स्वास्थ्य सेवाएं प्रदान करना एक चुनौती बना हुआ है। प्रत्येक देश ने अपनी नीतियां निर्धारित की हैं, जिसमें वर्तमान स्वास्थ्य देखभाल प्रणाली के अंतर्गत विद्यमान स्वास्थ्य सेवा प्रणाली के अनुपात और स्थानीय जनता को वित्तीय जोखिम सुरक्षा प्रदान करने की सीमा होगी। सार्वभौमिक स्वास्थ्य कवरेज की मुख्य श्रेणी कर, वित्त, प्रणाली और सामाजिक बीमा प्रणाली पर आधारित है। इस समीक्षा लेख में चर्चा की गई है कि भारत सहित विभिन्न देशों ने किस तरह से योजना निर्मित की है और विभिन्न स्वास्थ्य देखभाल मॉडलों को लागू किया जा रहा हैं। इस लेख में यह भी उल्लेख किया गया है कि भारतीय संदर्भ में सार्वभौमिक स्वास्थ्य कवरेज कैसे अंगीकृत किया गया है।

मुख्य शब्द : सार्वभौमिक स्वास्थ्य कवरेज, स्वास्थ्य सेवाएं, स्वास्थ्य बीमा

Fire Safety In Hospitals- Issues and Challenges

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Abstract

Wherever there is risk, there is a need for safety and hence, the saying "Safety First". One can ignore safety only at his own peril. Accidents have a surprise element and can only be hedged by due preparedness and preventive measures. In this article, the risk of fire with particular reference to Hospitals has been discussed. While some accidents are manmade, many are because of faulty design of the building, inadequate safety provisions and lack of preparedness to fight the fire. Having fire safety measures is not only an ethical duty but also a legal obligation. By virtue of National Building Code (NBC) and the safety acts enacted by various state Governments, all hospitals, private or public, need to have safety systems in place. Compliance is critical in case of multi-storied hospitals and other high rise buildings. Escaping the fire is an impossible task for indoor patients; and hence, the importance of fire safety in hospitals and gives suggestions to plug-in the loose ends in safety compliance. It also emphasizes the collaborative effort that is needed from Civil engineers and Fire professionals to design fire proof hospital buildings which can sustain intense fire and facilitate timely evacuation of patients to safe places.

Key words: Fire Safety, Fire drills, Horizontal evacuation, Hospital design, Lay-out planning, *Fire exits.*

Introduction

India has witnessed fire accidents in quite a few hospitals and nursing homes. Among them, the fire at AMRI Hospital, Kolkota (2011), ESIC Hospital, Mumbai (2018) and SUM Hospital, Odisha (2016) are some recent ones. In all these cases, what came to surface is the lack of adequate fire safety measures. All hospitals and nursing homes have to necessarily get the NOC from the competent authority before starting their business operation. Thereafter renewal is needed at regular intervals. NOC is a paper compliance, which is the starting point. More important issue is whether the enforcement authorities visit these premises and check the ground realities. On the paper, everything can be shown to be fine yet on the ground; the scenario could be a complete anti-thesis. Fire creates panic and nowhere it causes more panic than in a hospital. Oxygen cylinders and other inflammable consumables in hospitals facilitate quick ignition and spread of fire. Fire not only damages the property but also kills many helpless patients who are incapable of escaping the hospital building filled with smoke and fire. Staffs of the hospital and the fire fighters do their best but fire does spread fast and causes casualty. The screen of smoke, the commotion and blocked pathways, makes it impossible for the insiders to escape. In high rise hospitals, people even jump out breaking windows and glass panels in desperation and kill themselves. Such is the fury of fire. Hospital authority can be prosecuted for negligence and loss of life in the court of law. They are also legally liable to compensate the victims. In this article, causes of fire accidents in hospitals have been discussed and a list of remedies has been recommended.

Discussion

Fire services in India is covered under the Twelfth Schedule of the Indian Constitution (Article-243W). The performance of all the functions is listed in the Twelfth Schedule comes under the domain of Municipalities. Fire prevention and fire protection is a state subject. The rules for fire prevention and fire protection are laid in the form of State Regulations or Municipal By-Laws. Most of the states and UTs have enacted their laws incorporating the provisions in the National Building Code (NBC). Hospitals are required to abide by all safety acts related to fire. Some of the important ones are: the National Building Code (NBC, 1970 and subsequent amendments), Hazardous waste (management and handling) Rules, 1989 and amendments, Indian Electricity Act 2003 and Rules 2005, Gas cylinders Rules 2004 and Indian Boilers Act 1923.

While designing a hospital building, engineers and architects should take into account the guidelines and stipulations in these laws and regulations. Adherence is essential as any deviation can lead to or can escalate the fire accidents resulting in loss of lives and property. National Building Code (NBC) is the basic model code in India on matters relating to building construction and fire safety. In addition to regulating building code also specify fire-resistance requirements as a function of building occupancy and size i.e. height and area of the building. In general, fire resistance is defined as the relative ability of construction assemblies such as floors, walls, partitions, beams, girders, and columns to prevent the spread of fire to adjacent spaces or perform structurally when exposed to fire.

Health care is provided in big corporate hospitals and also at small nursing homes and medical centers. The design requirement for each type is different. While most of the corporate hospitals are multi-storied and evacuation is a challenge; in case of small nursing homes, lack of awareness and training combined with poor evacuation and fire management leads to fire accidents. An engineer must look at the structure and the multiple activities of health care outfits while designing the layout of the campus and the building structure. For example, the assembly area in case of a fire accident is an important part of lay out and must be a place which can be easily reached from all corners of the hospital. In the multi-storied hospital buildings, in addition to the vertical stair for fire escape, horizontal bridges connecting floors is something that needs the attention of the designers. Similarly, the width of the corridors and sizes of doors and windows are important parameters that need to be considered. An architect should look at the fire safety issues while giving a nice look to the building interiors and outside designs. Provision of water tanks, water sprinkler systems at strategic points, proper installation of fire safety equipment and provisions should also be looked into.

Fire is usually small when it starts and requires fuel to grow in intensity and magnitude. In fact, many fire either self extinguish due to a lack of readily available fuel or are extinguished by building occupants. Furthermore, even though most fire involves building contents, a combustible building itself may be the greatest potential source of fuel. By definition, noncombustible materials such as stone, concrete, brick, and steel do not burn; and therefore, do not serve as sources of fuel. Although the physical properties of noncombustible materials may be adversely affected by elevated temperature exposures, these materials do not contribute to either the intensity or duration of fires. Wood, paper, and plastics are examples of combustible materials.

In the 9/11 attack in 2001, three towers including the twin towers collapsed in the USA. An investigation into the collapse revealed that the collapse was because of the fire. Research has found that fire damaged the structure very fast that led to the collapse. It is found that most of the structural designers take into account earthquake and wind pressure while designing the structure but rarely consider the impact of possible fire accident on high rises. But after 11/4, concerns about fire safety have taken traction not only in the USA but also across Europe. The fire design is not about fireproofing or fire prevention but is about designing a building that can withstand the forces of fire. It also includes the design that facilitates evacuation in case of an accident.

In one article, Wermiel S narrates the evolution of the fire safety system in high rise buildings in USA¹. He highlights how the outside metallic fire escape staircase of nineteenth century has been replaced by inside stairway protected by fire resistant walls in most of the buildings in contemporary times. Further, many buildings also have horizontal staircase so that patients can be shifted from one tower to another tower without taking the route of vertical stairs. Many times the vertical stairs are blocked because of collapse of parts of the building and the lift is not to be taken in case of a fire. One may just get locked and suffocated inside a lift.

Another important source of fire is boilers installed in hospitals. Boilers are an integral part of every hospital. They are used for sterilization, maintaining humidity, laundry and cooking. Though the utility value of a boiler is very high, disregard to safety norm can cause fire and devastation. Under Section2(b) of the Indian Boilers Act 1923, Boiler is any closed vessel exceeding 22.75 liters in capacity which is used expressly for generating steam under pressure and includes any mounting or other fitting attached to such vessel, which is wholly or partly under pressure when shut off. As per the Act, it is not only essential to register the boilers with the Labor Department but also ensure that regular check up is made as per SOP. Factory Inspector visits the hospitals to inspect the boilers and certify its fitness.

Apart from faulty building design and boilers, the other major reason of fire is lack of fire consciousness among the stake holders. Now let us look at literature on fire safety and dwell on global experiences. In an article written aftermath the fire in the AMRI Hospital, the author² has highlighted how building approvals are being given violating the National Building Code. It also mentions how the initial warning of fire from the nearby slum dwellers was ignored, and how smoke spread into the whole hospital through the air-condition ducts. There was fire in this hospital in 2008 and no lesson was learnt from the past mistakes. In similar vein, the editorial of Economic and Political Weekly (June-2011) titled Playing with Lives mentions how casual many of the corporate hospitals are with regard to fire safety³. The editor highlighted the fact that because of good PR skill, and also nexus between the hospitals and the enforcement agencies, fire safety has been a casualty.

Dodgson M, et al.⁴ mentions how various engineering departments should take inputs from Fire engineers to ensure that the structure is fire proofed but also allows quickest rescue in case of a fire mishap. The author also highlights that with the cutting edge software products that are now available in the market, simulation techniques can be used to assess the fire readiness of any structure. In this article, even the possibility of using lift as an escape route has also been discussed.

Fire mishaps do not happen because of a mistake on a particular day, it is a systematic failure that leads to such disasters. In an article, Beard, A.⁵ proposes a systems approach to fire safety management. It will be an interaction of six subsystems which will include all facets of the

safety namely– building structure, maintenance, safety equipment, communication, decision making and safety culture. This article is very relevant in the Indian context where safety is a neglected activity and is considered to be the responsibility of Administration or Safety department.

Another researcher has proposed a complete ban of smoking in British hospitals⁶. But this article sparked reactions from hospitals who favor purposive limited smoking in hospitals. The argument put forth is two-fold: i) There is only a small segment of population who suffer from illness that will aggravate with smoking. For rest of the patients who are habitual smokers, smoking should not be banned; and ii) Patients who are passing through terminal diseases should not be deprived of the last pleasure that they have in life, namely smoking. In their view withdrawing smoking from them is unethical and is against the code of medical profession.

In 60 per cent of the cases, smoking caused fire in US Hospitals. In this article, the authors narrate how the doctors in various states adopted no-smoking policies to support not only the patients who suffer from cardiovascular and lungs related ailment but also help alleviate the risk of fire⁷. Another researcher found "No Smoking" compliance in nearly 90 per cent of the hospitals in USA⁸. As per COTPA Act (The Indian Cigarettes and Other Tobacco Products Act, 2003) smoking in public places is prohibited and such public place includes hospitals, nursing homes and other medical care facilities. However, compliance and enforcement of the above Act has been rather sketchy.

Fire accidents don't give an advance notice. Morris, E.⁹ mentions two major reasons of fire in hospitals– one, electrical short circuit and the other, smoking by the patients or their attendants. In this, he mentions the importance of stairs and exit pathways for rescue/escape from a premises affected by fire and filled with smoke. He also mentions the importance of fire extinguishers; fire drills and regular check up of electrical equipment to minimize the risk and fatality due to fire. But he has underscored the fact that the major reason of hospital fire is smoking on bed and that menace needs to be closely monitored. He also emphasized that fire drills should be carried out in hospitals at least once a month so that the hospital staffs know what to do in case of a fire. While rushing away from the fire is instinctive, in case of a blockade one needs to know how to sustain oneself inside the building till the rescue facility is made available.

Nurses form the largest segment of manpower in any hospital and they have a great role to play in fire prevention and fire management¹⁰. Hollo, M. has designed a comprehensive course for the nurses for fire safety and suggests that right kind of training will go a long way in improving the fire safety of any hospital¹⁰. In an article in the American Journal of Nursing¹, the author describes how the first action of the nurses should be to remove the patients to safe locations, even before the fire brigade arrives or the firefighting equipment are ready for action. The author has drawn a comparison between the training as per the SOP in simulated environment and the actual adherence or execution of SOP in real fire accidents. Authors conclude that many times there is a great variance between the two and therefore, it is a good idea to study the actual fire evacuations made by any hospital and understand the intricacies rather than just be satisfied with in-house training and adoption of SOP. Such study of real fire evacuation gives better insight and makes the personnel more prepared for such exigencies. The author also mentions that though IT is an enabling instrument in normal times, in case of fire accidents, their utility reduces drastically.

Recommendations

Based on the discussion and the literature review, the authors make the following recommendations:

- One of the major facets of prevention is the building design. Fire proofing is a lofty goal but design engineers (civil engineers and architects) can design the layout of the hospital campus and the structure of the building in such a manner that the damage to life and property is minimal in case of a risk. Corridors, exit doors, horizontal bridges and fire proofed lifts are some of the things that need to be taken into account at the time of design. Use of non-combustible and fire-resistant items is another important issue that needs to be looked into. Fire safety is a specialized subject and there are professionals who have extensive knowledge on the subject. Fire safety is not part of the course of civil engineers in most of the engineering institutes. Therefore, a collaborative approach is needed between civil engineers and fire professionals at the time of lay-out and building design.
- Not only the Patients' room but also other store rooms should be fire proofed, as many of the items used in hospitals are inflammable- medicines, chemicals, cotton, oxygen cylinders, mattresses etc. Necessary care should be made to label these items properly and store them in a scattered manner so that fire in one item will not spread to the other items immediately. The importance of the clutter free corridor and duly maintained exit doors and windows are also very important to save lives from a fire accident. Another important point that is essential in hospitals is a proper alarming system in the hospital and the training to use such facility.
- For the purpose of controlling fire, every hospital must sensitize its staffs on the matter and train them in fire management skill particularly how to evacuate patients to safer places. There should be an SOP for fire management and all should act as per the SOP. Fire handling equipment should be installed at the appropriate places for easy accessibility in case of a fire.
- Fire drills and fire audits should be done at least once in two months so that the employees exactly know how to respond in case of fire.
- Proper maintenance of electrical equipment should be made on regular intervals.
- People visiting the hospitals (patients and their attendants) should not be allowed to smoke or carry any inflammable item inside the hospital. There should be proper checking to this effect. In short, fire can be very devastating and therefore, needs lot of attention from the building designers, hospital authorities and other stake holders of the hospital.
- Developing a fire conscience among the citizens of a nation is important in fire management. Moreover, fire safety should become an important matter of public debate. The destructive power of fire and the preventive methods should also be taught in schools and colleges. Insurance companies who provide coverage for fire risk should actively take part in such initiatives.

Conclusion

One of the major safety concerns in every hospital is outbreak of fire. Management of this risk needs adequate planning and preparation. It is a moral duty and a legal obligation for all hospitals to take adequate safety measures. It starts with building design which are fire resistant and that facilitates easy evacuation. Compliance of various statutory requirements is the least that is required. What is most desired is an honesty of purpose to ensure that fire accidents

are prevented, and in case there is an accident, there is no loss of life. SOPs are not enough. What is needed is how sincerely we abide by those SOPs. It is very important that all the stake holders of a hospital have a safety mindset. Life is precious and we can't be callous on that front. Nothing should be left to chance and everything should be closely monitored to prevent fire accidents.

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अस्पतालों में अग्नि सुरक्षा–मुद्दें एवं चुनौतियां

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सारांश

सर्वविदित है कि जहां जोखिम है, वहां सुरक्षा की आवश्यकता होती है तथा इसलिए कहा जाता है कि सुरक्षा सर्वप्रथम' है। कोई व्यक्ति अपने जोखिम पर ही सुरक्षा को अनदेखा कर सकता है। दुर्घटना में आकस्मिकता घटक होता है तथा इससे केवल तैयार स्थिति तथा रोकथाम उपाय से ही बचा जा सकता है। इस लेख में, अस्पतालों के विशेष संदर्भ में अग्नि से होने वाले जोखिमों पर विचार–विमर्श किया गया है। जबकि कुछ दुर्घटनाएं मनुष्य की त्रूटि से उत्पन्न हो जाती है, कई दुर्घटनाएं भवन के दोषपूर्ण डिजाइन, अपर्याप्त सुरक्षा संबंधी प्रावधानो तथा अग्नि घटनाओं का सामना करने की अपर्याप्त तैयारी के कारण घटित हो जाती है। अग्नि सुरक्षा संबंधी उपाय मौजूद होना केवल एक नैतिक कर्तव्य नहीं है, अपितु एक वैधानिक बाध्यता भी है। विभिन्न राज्य सरकारों द्वारा राष्ट्रीय भवन कोड आधार बनाने तथा सुरक्षा अधिनियम लागू करने के कारण प्राइवेट अथवा सार्वजनिक सभी अस्पतालों को अपने स्थलों पर अग्नि सुरक्षा प्रणाली उपकरण ऊंचे–ऊंचे भवनों के मामले में इनका अनुपालन करना जटिल है। अंतः रंग रोगियों के लिए आग से बचाव करना बहुत असंभव कार्य है, तथा इसलिए अस्पतालों में अग्नि सुरक्षा संबंधी उपायों की अनुपालना करना अत्यावश्यक है। इस लेख में, अस्पतालों में अग्नि सुरक्षा प्रणाली अनुपालन की व्यापक समीक्षा की गई है तथा सुरक्षा संबंधी अनुपालन में शिथिलता वाले पक्षों पर बल देने के बारे में सुझाव दिए गए है। प्रस्तुत लेख में अग्नि रोधक अस्पतालीय भवन के डिजाइन तैयार करने के लिए सिविल इंजीनियरों तथा अग्नि सुरक्षा व्यावसायिकों द्वारा आवश्यक रूप से किए जा सकते वाले संयुक्त प्रयासों पर भी बल दिया गया है जिनसे उग्र रूप से आग लगने की घटनाओं की रोकथाम हो सकती है तथा रोगियों को समय पर सुरक्षित स्थानों पर ले जाने में भी सहायता मिल सकेगी।

प्रमुख शब्दः अग्नि सुरक्षा

Accessibility of Primary Health Care to Urban Poor: A Study in Pune, India

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Abstract

This paper analyzes the state of health and access to health services among the urban poor in India. The analysis is based on data from a primary survey conducted among 800 women from Pune city, India. Descriptive statistics and regressions (using SPSS and STATA) were used for data analysis. Results show a high preference for private health facilities for OPD and a high preference for government facilities in case of hospitalization. The statistical analysis of the determinants of acute illness in the selected slums indicates the insufficiency of basic amenities like sanitation, garbage disposal, and potable water. Together with less accessibility to government health facilities and more reliability on private health care services, the results indicate the continued vulnerability of the urban poor and the need for urgent government action.

Key words: Accessibility, Urban poor, Primary health care, Slums, Public policy.

Introduction

India like the rest of the developing world is urbanizing. Towns and cities are witnessing rapid expansions as increasing numbers of people are migrating to urban areas in search of economic opportunities. As per census 2011, the urban population in India amounts to 377 million exhibiting a rise of 31 per cent over the last decade. This rapid growth in the urban population has outpaced the provision of affordable housing and environmental and health infrastructure. The shortfall in urban housing has led to the proliferation of slums and squatter settlements in Indian cities¹. Crowded living conditions, unhygienic surroundings, and lack of basic amenities such as garbage disposal facilities, water, and sanitation characterize slums in India². Therefore, the low provision of civic amenities coupled with a lack of primary health care services in most of the urban poor settlements has an adverse impact on the health status of its residents².

It is understood that the health of the urban poor is significantly worse than the rest of the urban population and is often comparable to the health conditions in rural areas. The 10th five-year plan (2002-2007) observed that unlike the rural health services, there have been little efforts to provide well-planned primary, secondary and tertiary care services in geographically delineated urban areas. It is observed that the primary health care facilities have not grown in proportion to the explosive growth of the population. Ineffective outreach and weak referral systems also limit the access of urban poor to health care services. The 12th five-year plan of Government of India seeks to pay systematic attention to urbanization and spearhead the process of inclusive infrastructure development in cities. As part of the plan, the government has launched the National Urban Health Mission (NUHM) to address the health concerns of the urban poor through facilitating equitable access to a strengthening of the existing capacity

of health delivery for improving the health status of the urban poor (Ministry of Health and Family Welfare, 2008).

A significant body of literature exists on the various aspects of urban health like maternal and child health, the health of the aged, treatment-seeking behaviour, etc. However, the focus has been narrow in most of the analyses that are also often based on case studies or small samples drawn from a few geographical areas. In the current study, efforts are taken to understand the accessibility of primary health care services in the selected slums of Pune city. These data were used to understand the access to health services of the urban poor, and link it to their health status.

Literature Review

It has been noted globally that in recent years that the number of slums has decreased from urban areas but the absolute number of slum dwellers has increased over the years. Many studies from developing countries indicate that the proportion of the urban population living in slums has declined from 39 per cent in the year 2000 to 33 per cent in 2012 but the absolute number of slum dwellers in urban areas from the same countries has increased from 760 million from the year 2000 to 2012³. Similarly, in India, the percentage of slums decreased from 24 per cent in 2001 to 22 per cent in 2011, while absolute numbers of people living in those slums increased from 52 million to 65 million⁴. A report from UN-HABITAT highlights that the urban poor, especially the slum dwellers in developing countries has the worst living condition as compared to their rural counterparts⁵. The report also provides evidence of differences in a social structure where one part of the urban population has a good quality of life, and the other part, i.e. the slums and squatter settlements, have worse living conditions⁵. In such adverse living conditions, slum dwellers are likely to die earlier than the rest of the population of the city and have fewer opportunities to improve their human development parameters⁶.

Health Care Scenario in Urban Slums

The first recommendation on improving the primary health care in India was given by the Bhore committee in 1946. The committee aimed to survey the health conditions of people in the country and make recommendations for future development. In 1978, India adopted the Declaration of Alma-Ata that expressed the need for urgent action by all governments, all health and development workers, and the world community to protect and promote the health of people⁷. The AlmaAta Declaration also emphasizes that everyone should have access to primary healthcare, and everyone should be involved in it. The primary healthcare approach encompasses the following key components: equity, community involvement/ participation, inter-sectoral, appropriateness of technology, and affordable costs⁸. After independence, considering the predominance of the rural population, greater emphasis was laid on infrastructure development and manpower for service delivery mainly in rural areas; this was evident in the allocation of funds to the rural health care sector in almost all initial five-year plans⁹. But in the recent years, the demographic scenario in India is changing rapidly; the proportion of the urban population was 11 per cent in 1901, 26 per cent in 1991 and presently it is more than 30 per cent. Urban slums which are a significant part of urban areas are demographically, economically, and environmentally vulnerable settlements. The health indicators always provide a better picture of the urban areas as compared to the rural areas. Yet it must be realized that the average figures of urban areas hide the stark reality as slums in urban areas are characterized by high morbidity and mortality rates¹⁰.

The near-total absence of civic amenities coupled with inadequate primary health care services in most urban slums has an adverse impact on the health status of its residents. Urban health infrastructure in India is neither appropriate nor adequate and has not been able to meet the needs of the urban population, especially the poor¹¹. According to Rural Health Survey (RHS) 2011, as in March 2011, there are 148,124 sub-centers; 23,887 PHCs; and 4,809 community health centres (CHCs) functioning in India. The norms set for the population coverage for subcentre, PHC, and CHC for plane areas are 5,000; 30,000; and 120,000 respectively. As per RHS 2011, the average population covered by a sub-centre, PHC, and CHC was 5,624; 34,876; and 173,235; respectively. For allopathic doctors at PHCs, there was a shortfall of 12.0 per cent of the total requirement for the existing infrastructure as compared to manpower in position. Considering the population norms for PHC of 30,000 in-plane areas, India requires more than 27,700 PHCs. So, when compared with RHS 2011; India requires 3,800 more PHCs. The 10th five-year plan (2002-2007) observed that unlike the rural health services, there have been little efforts to provide well-planned primary, secondary, and tertiary care services in geographically delineated urban areas. It is observed that the primary health care facilities have not increased in proportion to the explosive growth of the population in urban areas. Ineffective outreach and weak referral systems also limit the access of urban poor to health care services¹¹. The 12th five-year plan of Government of India seeks to pay systematic attention to urbanization and spearhead the process of inclusive infrastructure development in cities. As part of the plan, the government has launched the National Urban Health Mission (NUHM) to address the health concerns of the urban poor through facilitating equitable access to a strengthening of the existing capacity of health delivery for improving the health status of the urban poor.

Despite an increasing concern for women's health in India, their exposure to illness continues to be very high (National Sample Survey Organisation- NSSO 2014); mainly due to the dominance of various social conditions in which gender plays an important factor in framing their ill-health experiences. This is evident when we look at the global gender gap reports that portray the continued decline in the health performance of women in India. The latest report on the gender gap reveals that India was ranked at 143 out of 149 countries though, in other parameters like education, economy, and politics, there has been good progress (Global Gender Gap Report 2015). It indicates that the health performance of the country's women stays at the bottom of the gender development index.

Despite putting maximum efforts by the government through their various policies and programmes in providing excellent primary health care facilities to women, there are issues in accessibility to these primary health care facilities, especially in urban areas. Kiranmai K¹² in their study talks about three major ideas that are related to comprehensive women's health outcomes; personal factors, the health system factors, and lastly social, economic, and cultural factors. Their work is a cross-sectional study designed to examine the perceived and actual health status and health practices of women aged 18 to 64 years in the selected case study area. The results indicate that the perceived health condition by the women is good as a fact that in spite of many health problems, they were not in medication and didn't visit a doctor. Sribas¹³ in his study also concluded that social, economic, spatial, and cultural factors together determine the healthcare behaviour of women in slum areas. In their case study area, only 31.33 per cent of women breastfed their children one day after delivery, 31 per cent of women respondents purchased medicines from local unrecognized shops, 6.6 per cent of infant mortality cases, and 32.33 per cent of women used sterilization method to control reproductive health. In their study area, pertaining to low education in women led to believing in traditional ways of medication

for their health problems. Incomplete tuberculosis and malaria treatment led to recurrences and relapses. The health care facilities were far from poor settlements, and resulting in a long and expensive trip. The hospitals are also often overcrowded and manned by unfriendly, unsympathetic doctors. Most urban poor women prefer to consult private practitioners who are normally expensive, and there is a tendency is to avoid government doctors until the illness becomes very serious.

In India, apart from Socio-economic factors, certain socio-psychological factors result in gender disparity in health and higher mortality rates. Indian females are still subjected to foeticide and excess mortality. There exists gender discrimination in nutrition, immunization, treatment-seeking behaviour, and living arrangements of women. Geetha S and Swaminathan Madhura (1996) in their study on the sex wise nutritional status of children aged five and below showed that girls are mal-nourished as compared to boys. In this study, weight for age and Mid-arm circumference (MAC) indicators were used. Based on weight for age, 60.9 per cent of boys and 72 per cent of girls were undernourished. The MAC indicator showed that 19.8 per cent of boys and 36.8 per cent of girls were undernourished. These studies prove that men and women have unequal access to health care; girl children are less immunized than boy children; have less access to hospital treatment¹⁴.

Bilkis¹⁵ mentioned socio-psychological perceptions of most rural and many urban women petrified by centuries of patriarchal supremacy and a family system where the father and subsequently the husband are considered as equivalent to God. "The feeling of inferiority has been embedded in their psyche so much so, that far from condemning acts of violence against them, they are more likely to throttle the voices in favor of them. This is part of the clichéd vicious circle of illiteracy and social backwardness that accounts for all the resultant backwardness of the gender."

Guin in his paper analyzes the state of health and access to health services among the urban poor in India. Based on the data from a survey conducted among 2000 households, the results showed lack of proper government facilities, a very high preference for private health facilities and a perception that private facilities are offering high-quality services as important concerns¹⁶.

Data on selected indices on maternal health from India suggest that very few women living in slums receive antenatal care, tetanus vaccinations, or had deliveries with the assistance of a trained birth attendant. Poor women from larger cities are worst in health care as compared to other size class cities. These poor women from larger cities are also anaemic. As per National Health Policy 2015, access to health services especially primary health care remains the key issue for most of India's poor especially in rural and remote areas and urban slums. The cost of travel may be prohibitive, or slum dwellers may be treated in health centres. Access must, therefore, be broadly defined to encompass its physical, social, cultural, and economic dimensions.

Methodology

The analysis of the primary survey that was conducted during March-April 2018 in 80 slums of Pune city. Out of 80 slums, 57 per cent slums were declared and 43 per cent were not declared by Pune Municipal Corporation (PMC). The main objective of this survey was to understand the health concerns of women living in urban slums and their approaches to access health care

facilities. Out of the 477 slums, 80 slums were taken for this study (confidence interval=8 % and confidence level 95 %). These 80 slums are further selected using the accessibility index method. Figure 1 below shows the accessibility index of various slums with respect to corresponding 50 medical facilities that include Maternity Homes, Family Welfare Centres, and Dispensaries. These 80 slums were further selected using a stratified sampling method where slums were selected from every classification of accessibility index (more slums are selected from low accessibility index as compared to high accessibility index classification).

For this survey, a minimum of 10 women was surveyed from each slum, and more emphasis was given on pregnant women for asking questions for this survey. Two questionnaires were prepared for conducting a survey at the slum level as well as household level. The parameters that were used in the preparation of questionnaire at household level included land use components, transport component, temporal component and individual component; and questionnaire at slum level included information of demographics of slum, sanitation, solid waste management, water supply, and education and health care facilities at the slum level.



Figure 1 Accessibility Index of Health Care Facilities of Slums

The questionnaires prepared helped in understanding the spatial complexities that arise from the accessibility and location of a particular facility. As mentioned above, the slums for this survey were selected using accessibility index method and from these 80 slums, approximately 800 households were surveyed.

The sampling unit was the household. Each participant was visited by a group of professionals at his/her home separately, and data gathering forms were filled out under the supervision of the group members. Household women were selected as the respondents in the study. In most of the cases, the surveyors confirmed the diseases reported by the respondents from the medical records.

The health survey was designed to collect data on the Out Patient Department (OPD) visits for the pregnancy period and hospitalization (in-patient) for the last six months of the survey. Details were sought on illnesses and treatment-seeking behaviour of the slum dwellers, especially women including expenditure. Data mainly included pregnancy and childbirth. Attempts were made to understand the patients' evaluation of the quality of health services for OPD, hospitalization as well as pregnancy-related services. The preliminary analysis was based on simple descriptive statistics to enable a better understanding of the factors that are influencing the health outcomes in the slums.

Findings

Socio-Economic Profile of the Samples

Figures presented below presents the basic socio-demographic characteristics across the 80 surveyed slums. Most of the women slum dwellers migrated from other parts of their home state to the current locations. The economic status of the respondents is based on the income level of the household and maximum households have a household income between Rs.10,000/- 15,000/- that presents comparatively a lower economic status as compared to their urban counterparts. When surveyed, it was evident that the majority of the women lived in these slums for more than 20 years and the majority of women population in surveyed slums was Hindu.



Figure 2 Household Income in the Surveyed Slums of Pune

Figure 3 Population Density per SqKm in the Surveyed Slums of Pune



Health Services in Slums

The research focused on women living in the slums, and they were asked about the existence and type of health facilities in the slum area. A majority (75%) of the 533 women who responded to the questionnaire said there were only private health facilities in the slums that included private hospitals and clinics. About four per cent of them said they were using the Public Health Centre (PHC) and 20 per cent of women were using public hospitals for health problems. The number of women using private clinics was also found to be high, almost 31 per cent, for addressing their health problems.

75 per cent of the women respondents said that it would take 20 minutes for them to reach the health care facility and on an average; it would take Rs. 20-30/- (one time visit) to reach the desired health care facility. Majority of the women stated that on an average, they spend 1200 rupees on yearly diagnostics.

Outpatient Visits

The sample study that was conducted on women in the prescribed period yielded a morbidity rate of 15 per cent. Since there were very few cases of second or third illness, the study analysed only those cases that have reported at least one illness in the reference period. The National Sample Survey (NSS) 71st round reports the proportion of ailing persons by residence status and sex during 15 days: for urban India, the figure was 135 per 1000 person, giving a morbidity rate of about 13.5 per cent which is lower than the rate estimated from the current survey of slums. The morbidity rate of the male urban population according to NSS 71st round is 10.1 percent¹⁷.

This is consistent with the view that the women living in the surveyed slums as a whole are relatively less healthy than the general population. Similarly, the results were comparable with the NSS estimates on diarrhoea and fever which were reported as the two most common ailments (47.3% and 31.2% respectively). Around 75 per cent of the ill women (399 out of 533) consulted a doctor for treatment. Of the remaining who did not seek doctor's help, a majority resorted to self-medication (71.7%) while some thought it was not necessary (27.6%).

Many reported distance or lack of availability of good doctors as reasons for not accessing treatment, again indicating the collective perception about availability and quality of health services in these slums. A majority (75%) of those who consulted a doctor preferred private facilities, of which about 46 per cent went to private hospitals and around 31 per cent went to private clinics. Only 20 per cent of the women preferred visiting government hospitals. Only a few (4%) women visited the Public Health Centre (PHC) for their treatments. The ease of access to private health facilities as indicated by the fact that 82 per cent of the people reported that health care facilities were available within 2 km from their residences. Also, a majority of the individuals could walk to the facility, indicating their relative accessibility.

While considered to be free, users of the government facility on an average paid more for all the components except consultation and transportation. Additionally, expenditure on drugs and medicines was the highest in both the categories. Higher diagnostic costs in government facilities probably indicate that the practice among such facilities of sending their patients outside- mostly in the private sector, for their diagnostic tests.

Quality of Service in Outpatient Visits

A majority of the women defended their choice of health service providers based on their perceptions of quality. Around 65 per cent of the sick individuals who consulted a private facility doctor stated that the waiting time for OPD was 20 minutes as compared to women who visited government facility where the waiting time for OPD was between 15 minutes and one hour. When it comes to waiting time for getting a bed in a government hospital during pregnancy, 80 per cent of the women stated that it takes one week as compared to private hospitals where 73 per cent of the women stated that it takes two days to get a bed.

Women were satisfied with the treatment and the behaviour of health facility staff; around 75 per cent reported being satisfied with the behaviour of doctors attending to their treatment. A majority of women (67%) reported good behaviour of junior doctors and 69 per cent of women stated that the behaviour of hospital staff was good. As for reasons for selecting a particular doctor during an OPD visit, the provider being a good doctor was considered as the most important reason for selection. Some other reasons were not uniform across all slums. For example, 2 per cent of the patients considered treatment cost whereas 30 per cent of the women considered proximity to doctor's clinic or health centre as factors other than a good doctor that influenced the choice for selecting a particular doctor.

Hospitalization

There were 343 cases of hospitalizations. Diarrhoea, stomach-ache, and fever were the most common reasons for hospitalization. Almost the entire sample of hospitalized individuals said they had to undertake only one visit to the hospital for their health condition. For hospitalizations, there seems a larger use of public hospitals, as compared to OPD cases. In about 40 per cent of the cases, individuals travelled more than 5 km to reach the hospital. Around 80 per cent of the individuals could reach the hospital in less than 40 minutes. About 67 per cent of the respondents stated good doctors as the most important reason for selecting the particular hospital followed by cost factor or inexpensiveness (26%); and proximity was

not found to be as important for the selection of a facility. Regarding the quality of treatment, a majority stated that they were satisfied with the treatment (82%) while only about five per cent were dissatisfied with the hospital, and the rest were indifferent. Similarly, a slightly lower but still a large proportion of individuals (77%) said they were satisfied with the nursing care received at the hospital. About 80 per cent of the respondents were satisfied with the behaviour of doctors and 79 per cent with the behaviour of other staff at the hospital. Around three-fourth (74%) of the respondents felt that the inpatient facilities were good, 21 per cent felt they were average, and around five per cent rated the facilities as poor.

Pregnancy and Childbirth

Since the family welfare programme has received a lot of emphasis in India, it was thought important to see whether services were available for the slum respondents. In the survey, emphasis was given on selecting pregnant women.

About half of the respondents had regular antenatal check-ups, while 41 per cent had done at least one check-up in first trimester while 28 per cent didn't go for any check-up in first trimester of their pregnancy. Of those who did not ever have any check-up (149 cases), the most stated reason was that it was not necessary. In the second trimester of pregnancy and 28 per cent of women had done at least one check-up in the IInd trimester of pregnancy and 28 per cent women didn't go for any check-up in this second trimester. Many women said they did not know about such check-ups. They also stated the lack of nearby facilities as a reason for not getting regular check-ups done. In the last trimester, 30 per cent of women didn't go for any check-up in the last trimester. As per WHO, there should be a minimum of four ante-natal visits by the pregnant women and in the surveyed slums, the figure was not encouraging.

When asked about the source of antenatal check-ups, about 39 per cent stated private hospitals as their source, indicating the presence of varied private sources for such visits. About 34 per cent visited government dispensaries for their check-ups while only around 13 per cent did check-ups at home. These statistics reconfirm the lack of urban focus of the government's family welfare services, especially for the poor. The quality of antenatal check-up was determined by two factors: whether the facility was open when visited during office hours and availability of health personnel at the time of visit. Almost all the women respondents using this facility and having visited during office hours said that it was open at the time of the visit, and about 85 per cent said that the health personnel was available every time they visited. Seventy-seven per cent rated the overall experience as good while the remaining rated it as average. No respondent rated the experience as poor.

Again, private facilities scored over the government ones for their accessibility and availability. The questionnaire also asked women who had one or more childbirths during the last year about the place of delivery and the quality of the facilities. Despite the stress on institutional deliveries by the government, around 8 per cent of the deliveries were conducted at home. 47 per cent of the deliveries were conducted at private hospitals followed by 44 per cent at government hospitals, and about one per cent at post-partum centers or health posts. Around 83 per cent stated that they would go back to the facility out of their choice. Overall, about 73 per cent rated their experience as good, and about 26 per cent said they were indifferent.

Determinants of Illness in the Surveyed Slums: A Multivariate Analysis

In addition to quality and accessibility to health services in slums, the presence of basic amenities like electricity, water, and sanitation has a significant impact on the health status of people. The survey at the slum level adopted a multivariate analysis of the determinants of the probability of acute illness where the following variables were used as independent variables: age, gender, economic status, social status, the presence of electric connection, quality of water, use of sanitary latrine for defecation and presence of choked open drains or choked public sewers in the neighborhood. The last four variables were included for hygiene and sanitation differences. Since no facility survey was undertaken, the presence of health facilities was not included in the analysis. In any case, the presence of health facilities is important in the analysis of treatment-seeking behaviour and does not directly impact on the occurrence of acute illness.

The summary statistics is given in Table 2. As for the remaining variables, 93 per cent of the slums had electricity connection, 75 per cent used a sanitary latrine for defecation, 55 per cent had foul-smelling water, and 58 per cent had open drains or choked public sewers in their neighborhood. The regression analysis in Table 2 indicates the relation between foul smell in water and acute illness. All other independent variables were not found to be significant.

A probit regression was estimated and the results are reported at the slum level. Rather than reporting the coefficients which are difficult to interpret, the marginal effects are presented i.e. the change in the probability for a tiny change in each independent, continuous variable, and the discrete change in the probability for dummy variables. Those slums that had foul-smelling water supply, had a 117 per cent higher probability of getting illness to its residents as compared to slums which did not have (p < 0.01). Those slums using sanitary latrines had a 76 per cent lower probability of illness as compared to slums using open fields or drain for defecation. Proximity to choked neighborhood drains in slums increases the probability of illness by 5.6 per cent as compared to slums away from choked drains. While the magnitude of the two variables (sanitary latrines and chocked drains) explain their contribution to illness, these variables, however, are not significant. Religion did not seem to influence morbidity among the slum dwellers.

| Independent Variables | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95.0% Confidence Interval for B | |
|--------------------------|--------------------------------|---------------|------------------------------|-------|-------------|------------------------------------|-------------|
| | В | Std. Error | Beta | | C | Lower Bound | Upper Bound |
| (Constant) | .038 | .185 | | .208 | .836 | 329 | .406 |
| Choked open drains | .079 | .147 | .079 | .538 | .592 | 213 | .371 |
| Foul smell water | .831 | .232 | .832 | 3.574 | <u>.001</u> | .368 | 1.294 |
| Sanitary latrine | .129 | .187 | .129 | .688 | .494 | 244 | .502 |

 Table 1

 Variables, Coefficients and Confidence Interval

(Dependent variable: illness, number of observations 80) Source: Primayr Survey

| Probit regression | | | Numbe | er of obs | = | | 80 | |
|-----------------------------|-----------|-----------|-------|-----------|-------|-------|-----------|--|
| , | | | LR cl | hi2(3) | = | 5 | 7.99 | |
| | | | Prob | > chi2 | = | 0.0 | 0000 | |
| Log likelihood = -26.229845 | | | | Pseudo R2 | | 0. | 0.5251 | |
| acute illness | Coef. | Std. Err. | z | P> z | [95% | Conf. | Intervall | |
| | | | | | | | | |
| choked_open_drains | .3168653 | .6953875 | 0.46 | 0.649 | -1.04 | 6069 | 1.6798 | |
| foul_smell_water | 6.538425 | 454.7659 | 0.01 | 0.989 | -884. | 7863 | 897.8631 | |
| sanitary_latrine | 4.268333 | 454.7653 | 0.01 | 0.993 | -887. | 0553 | 895.592 | |
| cons | -5.231164 | 454.7653 | -0.01 | 0.991 | -896. | 5547 | 886.0924 | |

Table 2Regression Results

 Table 3

 Probability of Illness: Probit Regression Results

| | - | | | | | |
|--|---------------------------------|----------------------------------|----------------------|-------------------------|----------------------------------|---------------------------------|
| | dy/dx | Delta-method Std. Err. | z | P> z | [95% Conf. | Interval] |
| foul_smell_water sanitary_latrine choked_open_drains | 1.171247 .7645989 .056761 | 81.46364 81.46355 .1245384 | 0.01 0.01 0.46 | 0.989 0.993 0.649 | -158.4946 -158.901 1873297 | 160.837 160.4302 .3008517 |

Notes: Df/Dx represents a change in probability. p<0.01, *Source: Primary Survey*

Discussion

The Report of the Steering Committee on Urban Development and Management for the 12th Five-Year Plan set up by the Planning Commission gives a comprehensive analysis of reforms needed to set right the urban problems India is facing. Needless to say, the recommendations in the report require a serious overhauling of the system which might take a much longer than anticipated. The very low availability of urban health services for the urban poor and the non-functioning of those that are available indicate a serious lapse on the part of the government in urban health planning. Suffice to say that despite some serious attention being paid by the central government as well as state governments to improve the health situation in the urban slums, very little progress has been made so far. Therefore, a different and innovative approach is needed to tackle the urban health issues, to prevent further deterioration in health outcomes and inequities in the country.

Healthcare in India consists of a universal health care system run by the respective State Governments. The Constitution of India requires every State Government with 'raising of the level of nutrition and the standard of living' of its people and 'the improvement of public health' as among primary duties. The National Health Policy was endorsed by the Parliament of India in 1983 and updated in 2002¹⁸. Although, this policy aimed to achieve "Health for All" within a specified time frame, the reality is different after decades of their implementation. In the absence of a proper policy framework, there is a heavy burden on government sector hospitals which are generally under-staffed and under-financed. Poor services at the state-run hospitals force many people to visit private medical practitioners and private clinics and hospitals.

The results from the current primary survey are consistent with the past findings that urban

slums are under-served by government facilities, with private providers and facilities scoring high as they have high perceptions about the quality of private health care services. Although the OPD services of the private facilities are expensive yet people prefer going there to avoid unnecessary waiting times.

Conclusion

The current survey indicates the overwhelming participation of private providers in the provision, duplication of private and public facilities in many slums. This study corroborates the findings and also indicates that private providers are most likely to be present in the market for curative primary care; but for hospitalization and deliveries, their presence is relatively less. From the demand side, for bigger expenses, individuals still seem to be looking for a low-cost care, and if there are cheaper alternatives like government facilities, they were likely to visit those. These findings are consistent with earlier findings in the primary health care sector that for higher treatment costs, the government sector or other cheaper alternatives may still be preferred, but for OPD, an overwhelming majority goes to private providers.

The impacts of lack of basic amenities like sanitation, garbage disposal, and potable water on health on the one hand, and accessibility and quality issues of health facilities on the other, make the urban poor vulnerable to health shocks. The onus of slum development has been mostly on the government, and it does not seem as though it has succeeded to provide a clean environment and adequate basic facilities. In fact, the situation has remained almost static for the past several years.

From the surveys, it is also apparent that women in slum areas of Pune have primary health care facilities that are spatially accessible to their habitable places. For this study, the primary survey conducted on approximately 600 women living in slums of Pune confirmed that despite better spatial accessibility to PHCs, only 9 per cent of total surveyed women were using PHC facility. The rest of the women were dependent on private hospitals or clinics for their medical treatments. To understand the possible reasons for non-accessibility to PHC, from the survey it is brought out clearly that there were no obvious socio-economic reasons that are making these public health care facilities non-accessible to women. The most understandable reasons that women gave while interacting with them during this survey included the behaviour of administrative staff, nursing staff and doctors; waiting times in PHC; and the timings of PHC that are forcing them to use the private medical facility as compared to a public facility. The doctors stationed in PHC don't give ample time to discuss medical issues with women in OPD; they don't even touch or examine patients properly and prescribe medicines just looking at the patients once they share their symptoms. It was also observed that many PHCs had no chairs for patients in OPD; women were sharing their medical issues with doctors while standing and in many cases, within 2 minutes doctors prescribed medicines. Such incidents make women believe that their treatment is not done properly which led them to private medical facilities for treatment. In private medical facilities, the cost of treatment is high but women feel satisfied as doctors listen to them and examine them properly. There is a sense of satisfaction in women after they get medical treatments in a private facility.

The survey also corroborated the fact that many women living in slums are working as housemaids or doing private jobs. The timings of PHCs are from 10 a.m. to 1 p.m. and from 2 p.m. to 5 p.m. which generally don't suit working women living in slums; and after coming back from work in the evening, they visit to private doctors for medical treatments.

It is necessary to sensitize doctors on better behaviours while giving treatment to slum-dwelling women. There should be a proper training mechanism for doctors and staff before they start working in PHCs. The discourteous behaviour of the staff in a government facility is common across the country. Many previous findings from different researchers¹⁹ confirm regularly that government facilities are understaffed and personnel here work under difficult conditions. Not only they are not trained adequately but also they are overburdened and work for long hours without proper support. If given proper training and providing a better working environment, there is a surety that the accessibility to government PHC services will increase shortly.

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शहरी निर्धन लोगों को प्राथमिक स्वास्थ्य परिचर्या सेवाओं की सुलभताः पुणे, भारत में एक अध्ययन

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सारांश

इस लेख में भारत में शहरी निर्धन लोगों की स्वास्थ्य संबंधी स्थिति तथा स्वास्थ्य सेवाओं की सुलभता का विश्लेषण किया गया है। यह विश्लेषण पुणे शहर भारत की 800 महिलाओं में संचालित किए गए एक प्राथमिक सर्वेक्षण आधार पर किया गया है। आंकड़ा विश्लेषण के लिए विवरणात्मक सांख्यिकी तथा प्रत्यावर्तन (एसपीएसएस और एसटीएटीए का प्रयोग करके) का प्रयोग किया गया था। प्रदर्शित परिणामों के मामले में ओपीडी सेवाओं के लिए प्राइवेट स्वास्थ्य सुविधाओं तथा अस्पताल में भर्ती कराने के मामले में सरकारी सुविधाओं को उच्च प्राथमिकता वरीयता देने के बारे में पता चलता है। चयनित मलिन बस्तियों में उग्र रोग संबंधी निर्धारकों के सांख्यिकीय विश्लेषण से वहां बुनियादी सुविधाओं जैसे स्वच्छता, कूड़ा निपटान व्यवस्था तथा पेयजल की अपर्याप्तता होने के बारे में संकेत मिलता है। इसके साथ–साथ वहां सरकारी स्वास्थ्य सुविधाओं की कम सुलभता तथा प्राइवेट स्वास्थ्य परिचर्या सेवाओं पर अधिक विश्वास होने से प्राप्त निष्कर्षों से शहरी निर्धन लोगों की भेद्यता बनी रहने तथा तात्कालिक सरकारी कार्रवाई किए जाने के बारे में संकेत प्राप्त होता है।

प्रमुख शब्दः सुलभता, शहरी निर्धन, प्राथमिक स्वास्थ्य परिचर्या सेवा, मलिन बस्तियां तथा सार्वजनिक नीति।
Cost Analysis of Dental Disease Drugs in India: Efficiency in Central Procurement System

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Abstract

Accessibility of medicine is largely dependent on affordability and availability of medicines. As medicines form integral part of a health system, a well-functioning health system would always ensure affordable availability of medicines essential for citizens. In most of the countries, especially in developing countries, oral health has been a neglected area, although it is an integral part of overall well-being. Data on the cost component of dental disease medicine is scarce. So, this study aims to address this lacuna. This research study is a partial economic evaluation that focuses on estimation of costs associated with medicines used in the treatment of selected oral diseases; and to suggest policy measures to reduce out-of-pocket expenditure on medicines.

Using cost analysis research design on Pharmatrac dataset and cross-comparing it with public procurement rates of Rajasthan Medical Services Corporation indicates pharmaceutical cost of treating caries and periodontitis is approximately three times higher if median retail prices are considered instead of Rajasthan Medical Services Corporation public procurement costs. Medicine cost of treating single episode of caries or periodontitis using Rajasthan Medical Services Corporation medicine rates at all levels of care is approximately 195-252 percentage points lower than retail prices of the same formulations. This strongly suggests that centralized public procurement of dental medicines with an efficient monitoring and control can reduce the out-of-pocket expenditure.

Key words: Cost analysis, Dental caries, Periodontitis, Public Procurement System, *Pharmaceutical Expenditure.*

Medicines are scientific innovations which have saved a lot of lives and greatly reduced the burden of many diseases. Provision of medicines to patients is one of the key functions of an efficient health system. Though the issue of equitable accessibility and affordability of essential medicines is today, a global concern but it seems to be more critical in developing nations due to inadequate public healthcare funding, inefficient supply chain management system, poor governance and lack of accountability.

In India, approximately 4 per cent of gross domestic product is spent on health care. The government contribution to the public health system is around one per cent of the gross domestic product. The households contribute around 71 per cent of total health expenditure in India¹. Household expenditure on health has been growing at nearly 14 per cent overall, and research shows that nearly 70-80 per cent of the health care expenditure is on drugs². Out of this huge expenditure, the health expenditure on allopathic medicines is 55 per cent¹. Thus, ensuring access to affordable medicines is essential to provide financial risk protection and improving health indicators.

Oral health is an integral part of overall wellbeing. And it is also true that oral health is the most commonly neglected areas of health not only because of ignorance but also due to financial constraints. In many developing countries, access to oral health services is limited and teeth are often left untreated or are extracted because of pain or discomfort. Despite improvements over several decades, oral diseases still persist as huge problem.

India is facing dual burden of chronic as well as communicable diseases. In order to reduce morbidity and mortality, it is essential to increase the public funding in healthcare. Rising health care costs, inelastic nature of healthcare demand and limited resources has made it mandatory to make efficient allocation of scarce resources. Sound decisions based on cost analysis are the basis of a health policy formulation.

One of the key barriers to access treatment to dental conditions may be the cost of medicines. This paper focuses on the economic burden to the society based on selected dental diseases. The aim is to collect information for evidence-based decision making by doing the cost analysis of medicines of selected dental diseases, and to find out innovative methods of financing to provide increased access to health especially oral health.

The analysis includes study of retail prices as well as rates at which the same medicines are procured through the public health system. Based on the study results, it is aimed to make policy recommendations, to reduce the OOP expenditure on dental medicines.

Literature Review

Caries is a Latin word meaning rotten. Dental Caries also called tooth decay or cavity, is an infectious microbiologic disease that causes demineralization of the calcified portion (enamel, dentin and cementum) and destruction of the organic portion of the tooth. The mechanism for tooth destruction is by acid production due to bacterial fermentation reaction of debris accumulated on the tooth surface. There is a constant process of demineralization and remineralization that goes on. But if the rate of demineralization exceeds re-mineralization cavities develops leading to food accumulation and further acid production and caries development.

Despite great achievements in medical sciences, still there is a high prevalence of oral health burden globally. Dental caries is the most common oral health problem throughout the world. It affects almost around 60-90 per cent of the school children in most of the developed nations and even almost all adults are affected by caries world-wide³. In many parts of Asia and Latin America, dental caries is highly prevalent⁴. Overall trend of dental caries is higher in developed nations as compared to the low income countries. But with modifications in dietary habits and lifestyles, it is expected that even the developing countries will have increase in the incidence of dental caries especially in low fluoride zones of the world⁴.

Worldwide, approximately 2.43 billion people (36% of the population) have dental caries in their permanent teeth⁵. It is the second most common cause of tooth loss and is found universally, irrespective of age, sex, caste, creed or geographic location. The prevalence of dental caries in India was 50-60 per cent in 2012⁶.

Periodontitis, commonly called pyorrhoea, is a set of inflammatory diseases affecting the periodontal tissues that surround and support the teeth. The disease leads to progressive loss of the bone supporting the teeth which can cause loosening of the teeth, periodontal pockets and eventually edentulism. Periodontitis is the second most common dental disease worldwide. Chronic periodontitis affects about 750 million people or about 10.8 per cent of the population as of 2010⁵. Globally, it is seen that around 30 per cent of people in the age group of 65-74 years, lose all their natural teeth and become fully edentulous³. Severe periodontitis which can eventually lead to tooth loss is seen in 15–20 per cent of the adults during their middle-age³. It is seen universally that most children have signs of gingivitis. In India the prevalence of gingivitis is 80-90 per cent and the incidence of chronic periodontitis is 21-28 per cent. Prevalence of chronic periodontitis increases steadily with age from 35.7 per cent for 30-39 years old to 89.2 per cent for 80-90 years old. The prevalence of aggressive periodontitis is below one per cent⁷.

Per capita expenditure on medicine in 2005-2006 was approximately US\$ 7.61 in lowincome countries and it was around US\$ 431.6 in high-income countries⁸. The rate of change in pharmaceutical expenditure as compared with 1995 statistics showed greater increase in middle and low-income countries. The reason behind the rising cost of expenditure is mostly attributed to lack of state intervention in cost control measures. The proportion of total health expenditure spent on medicines is higher in low per capita income countries. On an average, 24.9 per cent of total health expenditure is spent on medicines globally⁸. In India, approximately 70-80 per cent of the health care expenditure is on drugs². With low public spending in health, most of this expenditure in India is attributed to out-of-pocket payment.

Methodology

The study undertaken is a cost analysis method which includes the Indian adult population. The disease under investigation focuses on dental caries and periodontitis. The data on various market level drug price variable are captured from PharmaTrac and Rajasthan Medical Services Corporation, and the disease under study is captured from Disease Burden in India (National Commission on Macroeconomics and Health)⁹.

To proceed with the study, a list of medicines used in the selected dental lesions is prepared as per the standard treatment guidelines (STGs). STG is a clinical protocol document systematically developed to assist clinicians in making correct decisions regarding the diagnosis, management and treatment for specific clinical conditions. The guidelines were followed at four levels of health care which were in conformity with the Indian Public Health Standards. The levels of care were Level 1– Solo Physician clinic, Level 2– Six to ten bedded healthcare facility, Level 3– 30 to 100 bedded healthcare facility, Level 4– 101 or more bedded healthcare facility.

In the next step, the above mentioned list of medicines was broken down into the formulations based on the medicines and their specific dosage forms and strengths. Next, for each formulation, relevant packs in the PharmaTrac database were identified. The Rajasthan Medical Services Corporation Limited is a public enterprise established under the Company's

Act 1956. The objective of setting up this corporation was to efficiently manage procurement and distribution of drugs, medicines, surgical and suture items in Rajasthan¹⁰. The medicine market price and sales data was analyzed from AIOCD AWACS. It is a joint venture pharmaceutical market research company formed by the All Indian Origin Chemists and Distributors Ltd. and Trikaal Medi infotech Pvt. Ltd¹¹.

The data of Pharmatrac provided maximum retail price (MRP) and price to retailer (PTR) as per the pack size. It was observed that several brands have a more than one pack size. Therefore, per unit MRP and PTR was calculated by dividing the given MRP and PTR by the number of units in a pack. After calculating MRP and PTR, median prices of MRP and PTR was calculated. A list of medicines used in the treatment of selected dental lesions as per the standard treatment guidelines was prepared mentioning the dosage along with the schedule of treatment and length of treatment. The total number of units for every medicine used was calculated by multiplying the number of units prescribed per day with the length of treatment. Once the unit prices of selected medicine formulation was calculated from the 2012-13 data set of PharmaTrac and Rajasthan Medical Services Corporation procurement official documents, the total cost of each medicine used in the treatment of selected dental lesion was calculated separately for Rajasthan Medical Services Corporation procurement rates and retail market prices by multiplying per unit cost of medicine with the total number of units of medicine used for treatment rates and retail market prices by multiplying per unit cost of medicine with the total number of units of medicines used for treatment of selected dental lesion.

The total cost of treatment of selected dental disease was calculated separately for Rajasthan Medical Services Corporation procurement rates and retail market prices by adding the total cost of all the medicines used as per the standard treatment guideline schedule. The percentage difference in the cost of treatment of selected dental disease in the median retail market prices from the cost of treatment of selected dental disease in the Rajasthan Medical Services Corporation procurement cost was calculated. The percentage difference in the cost of each medicine in the median retail market prices and the Rajasthan Medical Services Corporation procurement cost was also calculated. The macro cost of the treatment of selected dental disease was also calculated by multiplying the burden of the selected disease in the Indian population by the treatment cost separately for the Rajasthan Medical Services Corporation procurement cost and retail market price. The percentage difference in the macro level cost of treatment of selected dental disease was calculated for Rajasthan Medical Services Corporation procurement rates and retail market prices. Ratio of the macro cost of treatment of selected dental disease using Rajasthan Medical Services Corporation procurement rates and retail market prices was also calculated to see the impact of centralized procurement system.

| Level of care | Capsule/Tablet/ Mouthwash | Drug | Strength | Schedule | Length of Treat- ment (In Days) |
|---------------|------------------------------|----------------------|-----------------------------|-----------|------------------------------------|
| | Capsule | Amoxycillin | 500mg | 8 hourly | 5 |
| Level 1 to | Tablet | Paracetamol | 500mg | 8 hourly | 5 |
| Level 3 | Tablet | Ibuprofen | 400mg | 8 hourly | 5 |
| | Mouth Wash | Chlorhexidine | 0.2% Concen- trated- 5mL | 12 hourly | 15 |
| | Capsule | Amoxycillin | 500mg | 8 hourly | 5 |
| | Tablet | Tablet Metronidazole | | 12hourly | 5 |
| Level 4 | Tablet | Paracetamol | 500mg | 8 hourly | 5 |
| | Tablet | Ibuprofen | 400mg | 8 hourly | 5 |
| | Mouth Wash | Chlorhexidine | 0.2% Concen- trated- 5mL | 12 hourly | 15 |

 Table 1

 Standard Treatment Guidelines for Dental Caries

Source: Standard Treatment Guidelines7

Table 2Standard Treatment Guidelines for Dental Periodontitis

| Level of care | Capsule/ Tablet/ Mouthwash | Drug Molecular Name | Strength | Schedule | Length of Treatment (In Days) |
|---------------|-------------------------------|------------------------|---------------------------|-----------|-------------------------------------|
| | Tablet | Ciprofloxacin | 500mg | 8 hourly | 5 |
| Level 1 to | Tablet Metronidazole | | 400mg | 12hourly | 5 |
| Level 3 | Mouth Wash Chlorhexidine | | 0.2% Concentrated- 5mL | 12 hourly | 15 |
| | Tablet | Ciprofloxacin | 500mg | 8 hourly | 5 |
| | Tablet | Metronidazole | 400mg | 12hourly | 5 |
| Level 4 | Tablet | Ibuprofen | 400mg | 8 hourly | 5 |
| | Mouth Wash | Chlorhexidine | 0.2% Concentrated- 5mL | 12 hourly | 15 |

Source: Standard Treatment Guidelines⁷

Table 3 Difference in Prices of Medicine Used in Treatment of Dental Caries between Retail Price and Rajasthan Medical Services Corporation (RMSC) Procurement Rates

| Level Of Care | Drug | Strength | Schedule (In Hours) | Length of treatment (Days) | Total Units | Median MRP per unit (In Rupee) | Minimum MRP per unit (In Rupee) | Maximum MRP per unit (In Rupee) | RMSC price per unit (In Rupee) | Difference in Price per unit (In %) |
|------------------|---------------------|--------------|-------------------------|-------------------------------|-------------|--------------------------------------|------------------------------------|---------------------------------------|-----------------------------------|---|
| | Cap Amoxicillin | 500mg | 8 hourly | 5 | 15 | 5.30 | 1.94 | 41.59 | 1.55 | 241.63 |
| | Tab Paracetamol | 500mg | 8 hourly | 5 | 15 | 0.99 | 0.004 | 9.3 | 0.23 | 330.44 |
| Level 1-3 | Tab Ibuprofen | 400mg | 8 hourly | 5 | 15 | 0.66 | 0.035 | 2.95 | 0.42 | 59.11 |
| | MW Cholrhexidine | 0.2%- 5mL | 12hourly | 15 | 150 mL | 0.44 | 0.30 | 0.68 | 0.16 | 172.74 |
| | Cap Amoxicillin | 500mg | 8 hourly | 5 | 15 | 5.30 | 1.94 | 41.59 | 1.55 | 241.63 |
| | Tab Paracetamol | 500mg | 8 hourly | 5 | 15 | 0.99 | 0.004 | 9.3 | 0.23 | 330.44 |
| Level | Tab Metronidazole | 400mg | 12hourly | 5 | 10 | 0.68 | 0.50 | 0.75 | 0.46 | 46.98 |
| 4 | Tab Ibuprofen | 400mg | 8 hourly | 5 | 15 | 0.66 | 0.035 | 2.95 | 0.42 | 59.11 |
| | MW Chlorhexidine | 0.2%- 5mL | 12hourly | 15 | 150 mL | 0.44 | 0.30 | 0.68 | 0.16 | 172.74 |

Findings

The pharmaceutical cost of treatment of dental caries at all levels of care is approximately three times higher if the median market prices are considered instead of Rajasthan Medical Services Corporation public procurement costs for the medicines prescribed as per the standard treatment guidelines in the year 2013. The percentage difference in the medicine cost of treatment of dental caries at initial stages (Level 1-3 of care), taking into account the burden of dental caries in India, comes out to be approximately 198 per cent. So, the medicine cost of treatment of dental caries at initial stages treated in level 1 to level 3 of care would be 198 per cent lower if the public procurement prices of Rajasthan Medical Services Corporation are taken into account instead of retail market prices. In a few drugs used in the treatment of dental caries, it was observed that there was a lot of variation in the market prices. For instance, the Capsule Amoxycillin 500mg used in the treatment of dental caries; the range of prices observed was wide- with the lowest priced brand of Intas Pharmaceuticals Company selling at Rupees 1.94 and the highest priced brand of Hetero Healthcare Limited selling at Rupees 41.59. It was observed that the percentage difference in the individual prices of medicines (used in the treatment of dental caries) between market prices and Rajasthan Medical Services Corporation

procurement rates varied in the range of 330.44 per cent for tablet Paracetamol 500mg, 241.63 per cent for capsule Amoxycillin 500mg, 172.74 per cent for chlorhexidine mouthwash 0.2 per cent concentration, 59.11 per cent for tablet Ibuprofen 400mg, and 46.98 per cent for tablet Metronidazole 400mg. The difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 1 to level 3 of care is Rupees 113.07 lower than the market prices of the same formulations. Similarly, the difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 4 of care is Rupees 115.24 lower than the market prices of the same formulations. The percentage difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 4 of care is Rupees 115.24 lower than the market prices of the same formulations. The percentage difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 1 to level 3 of care is approximately 198 per cent lower than market prices of the same formulations. Similarly, the percentage difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 4 of care is approximately 198 per cent lower than market prices of the same formulations. Similarly, the percentage difference in the value of medicines used for treating a single patient dental caries using Rajasthan Medical Services Corporation procurement rates at level 4 of care is approximately 187 per cent lower than market prices of the same formulations.

Table 4Differences in Pharmaceutical Cost of Treatment of Dental Caries between RetailMarket Prices and Rajasthan Medical Services Corporation (RMSC) Prices at MacroLevel Considering the Burden of Disease

| Level Of Care | Drug | Strength | Schedule (Hours) | Length of treatment (Days) | Total Units | Cost of treatment in Private Market (Rupees) | Cost of treatment with RMSC Rates (Rupees) | Difference in treatment Cost per patient (In %) | Burden Of Disease (in '0000) | Macro evel treatment price Difference (In %) | Ratio |
|---------------|-------------------|----------|---------------------|-------------------------------|-------------|--|--|---|---------------------------------|---|-------|
| Level 1-3 | Cap Amoxycillin | 500mg | 8hourly | 5 | 15 | | | | | 197.79 | |
| | Tab Paracetamol | 500mg | 8hourly | 5 | 15 | 170.23 | 57.16 | 197.79 | 62318 | | 2.98 |
| | Tab Ibuprofen | 400mg | 8 hourly | 5 | 15 | | | | | | |
| | MW Cholrhexidine | 0.2%-5Ml | 12hour- ly | 15 | 150 mL | | | | | | |
| | CapAmoxycillin | 500mg | 8hourly | 5 | 15 | | | | | | |
| | Tab Metronidazole | 400mg | 12hour- ly | 5 | 10 | | | | | | |
| Level | Tab Ibuprofen | 400mg | 8 hourly | 5 | 15 | 177.0 | 61.81 | 186.47 | 62318 | 186.47 | 2.86 |
| 4 | Tab Paracetamol | 500mg | 8hourly | 5 | 15 | | | | | | |
| | MWChlorhexidine | 0.2%-5Ml | 12hour- ly | 15 | 150 mL | | | | | | |

Source: Author's own calculations using variables from RMSC data, medicine market price and sales data was analyzed from AIOCD AWACS. Burden of disease data from report on National Commission on Macroeconomics and Health. The burden of disease is same across levels

Table 5

| Level of Care | Drug | Strength | Schedule (In Hours) | Length of treatment (In days) | Total Units | Median MRP per unit (In Rupee) | Minimum MRP per unit (In Rupee) | Maximum MRP per unit (In Rupee) | RMSC price per unit (In Rupee) | Difference in Price per nit (In %) | | | |
|---------------|------------------------|-------------------------------------|-------------------------|----------------------------------|-------------|-----------------------------------|------------------------------------|------------------------------------|-----------------------------------|---------------------------------------|--|--|--|
| | Tab Ciprofloxa- cin | rofloxa- 500 mg 12 l | | 5 | 10 | 5.9 | 1.57 | 16.93 | 1.26 | 368.92 | | | |
| Level 1-3 | Tab Metronida- zole | nida- 400 mg 12ho | | 5 | 10 | 0.68 | 0.50 | 0.75 | 0.46 | 46.98 | | | |
| | MW Cholrhexi- dine | 0 . 2 % -5mL | 12hourly | 15 | 150 mL | 0.44 | 0.30 | 0.68 | 0.16 | 172.74 | | | |
| | Tab Ciprofloxa- cin | 500 mg | 12hourly | 5 | 10 | 5.9 | 1.57 | 16.93 | 1.26 | 368.92 | | | |
| Level 4 | Tab Metronida- zole | TabMetronida- zole400 mg12hourly | | 5 | 10 | 0.68 | 0.50 | 0.75 | 0.46 | 46.98 | | | |
| | Tab Ibuprofen | 400 mg | 8 hourly | 5 | 15 | 0.66 | 0.035 | 2.95 | 0.42 | 59.11 | | | |
| | MW Chlorhexi- dine | 0.2%- 5mL | 12hourly | 15 | 150 mL | 0.44 | 0.30 | 0.68 | 0.16 | 172.74 | | | |

Difference in Prices of Medicine Used in the Treatment of Dental Periodontitis between Retail price and Rajasthan Medical Services Corporation (RMSC) Procurement Rates

Source: Author's own calculations

The pharmaceutical cost of treatment of dental periodontitis at initial stages (treated at Level 1-3) is approximately three times higher if the median market prices are considered instead of Rajasthan Medical Services Corporation public procurement costs for the medicines prescribed as per the standard treatment guidelines in the year 2013. The percentage difference in the medicine cost of treatment of dental periodontitis at initial stages (Level 1-3 of care), taking into account the burden of dental caries in India, comes out to be approximately 218 per cent. So, the medicine cost of treatment of dental periodontitis at initial stages treated in level 1 to level 3 of care would be 218 per cent lower if the public procurement prices of Rajasthan Medical Services Corporation are taken into account instead of retail market prices.

In a few drugs used in the treatment of dental periodontitis, it was observed that there was a lot of variation in the market prices. For instance, the tablet Ciprofloxacin 500mg used in the treatment of dental periodontitis, the range of prices observed was wide, with the lowest priced brand of Franklin Laboratories India Private Limited Company selling at Rupees 1.57 and the highest priced brand of Ranbaxy Laboratory Limited selling at Rupees 16.93.

It was observed that the percentage difference in the individual prices of medicines (used in the treatment of dental periodontitis) between market prices and Rajasthan Medical Services Corporation procurement rates varied in the range of 368.92 per cent for tablet Ciprofloxacin 500mg, 172.74 per cent for Chlorhexidine mouthwash 0.2 per cent concentration, 59.11 per cent for tablet Ibuprofen 400mg and 46.98 per cent for tablet Metronidazole 400mg. The difference in the value of medicines used for treating a single patient dental periodontitis using Rajasthan Medical Services Corporation procurement rates at level 1-3 is Rupees 90.42 and, at level 4 Rupees 177.68, lower than market prices of the same formulations.

The percentage difference in the value of medicines used for treating a single patient dental periodontitis using Rajasthan Medical Services Corporation procurement rates at level 1 to level 3 of care is approximately 218 per cent lower than the market prices of the same formulations. Similarly, the percentage difference in the value of medicines used for treating a single patient dental periodontitis using Rajasthan Medical Services Corporation procurement rates at level 4 of care is approximately 252.57 per cent lower than the market prices of the same formulations.

Table 6Differences in Pharmaceutical Cost of Treatment of Dental Periodontitisbetween Retail Market Prices and Rajasthan Medical Services Corporation (RMSC)Procurement Rates at Macro Level Considering the Burden of Disease

| Level Of Care | Drug Molecular Name | Strength | Schedule (In Hours) | Length of treatment (In days) | Total Units | Total Treatment Cost in private market (In Rupee) | Total Treatment Cost with RMSC Rates (In Rupee) | Difference In per patient treatment Cost (In %) | BurdenOf Disease (In '0000) | Macro evel treatment Price difference (%) | Ratio |
|---------------|------------------------|--------------|-------------------------|----------------------------------|-------------|---|---|--|--------------------------------|---|-------|
| | Tab Ciprofloxacin | 500 mg | 12 hourly | 5 | 10 | | | | 36248 | 218.2 | |
| Level | Tab Metronidazole | 400 mg | 12 hourly | 5 | 10 | 131.85 | 41.43 | 218.23 | | | 3.18 |
| 1-3 | MWChlorhexidine | 0.2% -5mL | 12 ourly | 15 | 150 mL | | | | | | |
| | Tab Ciprofloxacin | 500 mg | 12 hourly | 5 | 10 | | | | | 252.57 | 3.53 |
| | Tab Metronidazole | 400 mg | 12 hourly | 5 | 10 | | | 70.35 252.57 | 36248 | | |
| Level 4 | Tab Ibuprofen | 400 mg | 8 hourly | 5 | 15 | 248.02 | 70.35 | | | | |
| | MWChlorhexidine | 0.2% -5mL | 12 hourly | 15 | 150 mL | | | | | | |

Source: Author's own calculations using variables from RMSC data, medicine market price and sales data was analyzed from AIOCD AWACS. Burden of disease data from report on National Commission on Macroeconomics and Health. The burden of disease is same across levels

Discussion

The costing study gives estimated costs may not be the actual costs. It was identified that the medicine tablet Tinidazole which was not procured by Rajasthan Medical Services Corporation using the ATC DDD code. The researchers replaced it with tablet Metronidazole which also belongs to the Imidazole group and is therapeutically substitutable. The disease burden data is a prediction data used from NCMH report 2005 which represents the national level disease prevalence. These figures may differ from actual numbers. So, it is just an approximation of the cost burden of the disease. It was seen that there is a few missing information in PharmaTrac dataset for few formulations. Due to this reason, this analysis also did not include

the formulations for which data were missing or could not be identified in the PharmaTrac dataset. The researchers are unable to comment on whether the formulations have fallen out of production or the PharmaTrac database has failed to capture them. The quality of services is a big factor in success of a service delivery model¹² but the paper here does not look into quality of the medicine aspect.

The main focus of the study was to understand how the cost of treatment of dental diseases (under focus) with respect to its drugs can be reduced. The study clearly suggests that the mechanism of central drug procurement system has the potential to reduce the drug prices drastically to make it more affordable.

The findings of the study are suggestive of the fact that centralized procurement system of medicines backed up by efficient supply chain management and effective monitoring is the way to remove economic barrier to access to medicines. Similar conclusions were drawn by Selvaraj et al.¹³ stating that state and central governments must aim to procure drugs at a centralized level in each state. Centralized procurement gives the benefit of economies of scale and markedly reduces the price of the medicines. The successful models of centralized medicine purchase by the states of Rajasthan, Tamil Nadu and Kerala were emphasized proving that eliminating intermediaries from the supply chain can make the medicines affordable and accessible. As discussed by Tripathi et al.¹⁴, procurement in the public sector is quite economical with the median MPR for all medicines being 0.75 and the 25th to 75th percentile range being 0.43 to 1.02.

Conclusion and Recommendation

Observations made here, indicate that there is an increasing trend in health expenditure all around the world, and a very high segment of health expenditure is spent on medicines. So, it becomes inescapable to find ways to reduce the overall expenditure on medicines. In an attempt to find possible solution to reduce dental medicine expenditure, the central bulk drug procurement system seems to be far more efficient.

Another important conclusion which can be generated from this study is that the irrational use of medicine is also adding to the economic burden of treatment. So, it is important to strictly adhere to the standard treatment guidelines prescribed for diseases. This will not only reduce the cost of irrational drugs but also help in reducing the problems like antimicrobial resistance.

Centralized procurement system should be backed by monitoring and evaluation. Strict vigilance in quality control and cost control of medicines is mandatory for any system for effective results. It is also evident that generic drugs should only be prescribed as per the standard treatment protocols which will further reduce the cost. There should be standard treatment guidelines and medical protocols for all oral and dental diseases. Effective monitoring mechanism to ensure adherence to standard protocols is required. This not only reduces the cost burden but also decreases the irrational prescriptions and drug resistance. Lastly, there is a paucity of research on costing in dental procedures and medicines. There should be supportive measures to strengthen scientific research in the area of oral and dental diseases and its economic burden.

Moreover, to ensure access to essential affordable medicines, we need to increase the overall public expenditure on health along with efficient policies to ensure centralized procurement of

medicines and stringent laws to eliminate irrational use of drugs. The treatment cost of dental and oral diseases is extremely expensive. Most of the dental services comprise curative care with a little emphasis on preventive techniques. Most of the resources are directed towards emergency oral care and pain relief. Preventive care can be an effective way of capping the treatment burden of patients. Therefore, constant efforts should be made to prioritize preventive care with an aim to control or eliminate risk factors.

The recommended actions comprise:

- Strictly adherence to standard treatment guidelines and protocols to reduce irrational drugs and avoid unnecessary economic burden of treatment.
- Formulating effective policies for the centralized procurement of all the medicines including dental medicines. A balanced action between government, community and individual to achieve accessible, affordable health for all must be ensured.
- Generic drugs should be prescribed wherever possible to reduce the cost attributed to drugs.

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भारत में दंत रोग औषधियों का लागत विश्लेषणः केंद्रीय खरीद प्रणाली में दक्षता

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सारांश

औषधियों की सुलभता औषधियों की सक्षमता तथा औषधियों की उपलब्धता पर बहुत अधिक निर्भर होती है। चूंकि औषधियों स्वास्थ्य प्रणाली का एक अभिन्न अंग होती है, इसलिए एक संचालित स्वास्थ्य प्रणाली में नागरिकों के लिए आवश्यक औषधियों की सक्षम उपलब्धता हमेशा सुनिश्चित की जाएगी। अधिकांश दशों में, विशेष रूप से विकासशील देशों में मुख्य स्वास्थ्य एक अत्यंत उपेक्षित क्षेत्र है, यद्यपि यह समग्र स्वास्थ्य का एक अभिन्न अंग है। दंत रोग औषधियों के बारे में लागत घटक संबंधी आंकड़े दुर्लभ ही है। इसलिए इस अध्ययन का उद्देश्य इस कमी का पता लगाना है। यह शोध अध्ययन आंशिक आर्थिक मूल्यांकन है, जिसमें चयनित मुख रोगों के उपचार में प्रयोग की जाने वाली औषधियों से सह संबद्ध लागत के आकलन पर केंद्रित है, तथा औषधियों पर जेब खर्च में कमी लाने के बारे में नीतिगत सुझाव प्रस्तुत किए गए हैं।

फार्माट्रेक डेटासेट संबंधी डिजाइन लागत विश्लेषण अनुसंधान का प्रयोग करके तथा राजस्थान चिकित्सा सेवा निगम की सार्वजनिक खरीद दरों के साथ दो—तरफा तुलना करने पर यह संकेत प्राप्त होता है, कि यदि राजस्थान मेडिकल सेवा निगम की सार्वजनिक लागत की बजाय माध्य खुदरा मूल्य को ध्यान में रखा जाता है तो क्षरण तथा पेरियोडोंटाइटिस संबंधी फार्माश्यूटिकल उपचार लागत लगभग तीन गुना अधिक आएगी। परिचर्या के सभी स्तरों पर राजस्थान चिकित्सा सेवा निगम औषधि दरों का प्रयोग करके केरिस तथा पीरियोडोंटाइटिस के एक बार उपचार करने पर औषधियों की अनुमानित लागत समान फार्मूले पर खुदरा मूल्यों की तुलना में लगभग 195–252 प्रतिशत प्वाइंट कम पाई जाती है। यह सशक्त सुझाव है कि चिकित्सा औषधियों की केंद्रीय सार्वजनिक खरीद संक्षम प्रबोधन और नियंत्रण से किए जाने पर जेब खर्च में काफी कमी लाई सकती है।

मुख्य शब्दः लागत विश्लेषण, दंत केरिस,, पीरियंडोंटाइटिस, सार्वजनिक खरीद प्रणाली, फार्माश्यूटिकल व्यय।

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THE NATIONAL INSTITUTE OF HEALTH AND FAMILY WELFARE

The National Institute of Health and Family Welfare (NIHFW) an autonomous organization, under the Ministry of Health and Family Welfare, Government of India, acts as an 'apex technical institute' as well as a 'think tank' for the promotion of Health and Family Welfare Programmes in the country. The NIHFW is known for its Education, Training, Research, and Specialized advisory services.

Educational activities: The educational activities of the Institute contribute to Human resource development for better management of health and family welfare programmes in the country. The on campus courses are: Three-year Post-graduate Degree in Community Health Administration, a two-year Post-Graduate Diploma in Health Administration, and a one year Post-Graduate Diploma in Public Health Management. The Institute offers six Post-Graduate Diploma courses in distance learning mode of one year duration each. These are: Health and Family Welfare Management, Hospital Management, Health Promotion, Health Communication, Public Health Nutrition and Applied Epidemiology. These courses are need based and multidisciplinary in nature. The Institute has also developed certificate courses through e-learning mode for enhancing the skills and competencies of in-service middle level health professionals in the areas of 'Professional Development in Public Health and Health Sector Reforms' for Medical Officers, and "Programme Management for Public Health sector.

Training and Workshops: The training courses and workshops (intramural and extramural), numbering around 45-50 are organized by the Institute every year with an aim to familiarize the participants with the goals and the objectives of health and family welfare programmes; updating their knowledge and understanding of operational difficulties in implementation and suggesting remedial measures to overcome such constraints.

Research and Evaluation: The Institute gives priority attention to research in various aspects of health and family welfare. The Institute has an Academic Committee and a high level Programme Advisory Committee for ensuring the quality in academic endeavours. The Institute also conducts evaluation studies of National Health Programmes and various other related activities initiated by the Government of India.

Specialized Services: Specialized services of the Institute include Clinical services, National Cold Chain and Vaccine Resource Management Centre (NCCVMRC), Centre for Health Informatics, Skill Lab, National Documentation Centre and publications. The Ministry of Health and Family Welfare (MoHFW) has entrusted the Institute to act as a 'National Nodal Agency' to organize, coordinate and monitor the training programmes of Reproductive and Child Health (RCH) in the country. The main objective of the Clinic is to render Mother and Child Health services. The clinical work in relation to infertility, reproductive disorders, especially endocrinology and sexual dysfunctions deserve special mention. NIHFW in partnership with UNICEF through the National Cold Chain Management Information System, is responsible for the overall maintenance, implantation and monitoring of NCCMIS across the country including providing support to the end users. The reference, referral, press clipping and bibliographic services of the National Documentation Centre; and the publication, art and projection services of the Department of Communication compliment the activities of the Institute.

Advisory and Consultancy Services: The Director and faculty members of the Institute provide advisory and consultancy services to various national, international and voluntary organizations in various capacities.

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