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Perspectives and Issues**



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The Imposition of Sugar Tax in Malaysia: Will It Improve Health?

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Abstract

The bold move taken by the Malaysian Government in introducing the Sugar Tax is believed to not only fulfil the revenue generation agenda but more towards promoting a healthy lifestyle. This is due to the increasing numbers of obesity and diabetes cases reported for many years. The original idea of imposing the Sugar Tax is similar to the Tobacco Tax which aims at reducing its consumption. Thus, high expectations have been set by the Government to foresee the role of the Sugar Tax in combating health issues. Concluding the effects of a Sugar Tax in combating health issues may be too early but past experiences of countries that had imposed sugar tax earlier is worth looking into. Therefore, this article is hoped to shed light on the importance of implementing the Sugar Tax in combating health issue.

Keywords: sugar tax, health issue, healthy lifestyle, Malaysia.

JEL Classification code: H27, H31, P46

Introduction

The unwavering effort taken by the Malaysian Government to combat health issues cannot be denied. Most recently, the Government had introduced the Sugar Tax which took effect from 1 July 2019 and imposed only for the manufacturers; and that there are no plans to extend it to eateries. The introduction of Sugar Tax is seen not as a revenue generation agenda but more on tackling the unhealthy habits of excessive sugar consumptions by the Malaysians. The collection from such revenue, according to the Government, will be used to provide free and healthy breakfast to all the primary school children. Malaysia is not the first country that imposes such as tax to control the excessive amount of sugar intake of which the effect is still debatable.

The first country that had introduced sugar tax is the United States in 2014 which was then followed by other countries, including Asian countries (Table 1). This is in line with the recommendation by the World Health Organizations¹ to lower the sugar intake for better health, although there are some countries still delaying the tax to avoid overburdening the consumers with the hiking prices of sugar-sweetened beverages (SSB) related products². Based on the information provided, Malaysia is the latest in the edition among the countries imposing the Sugar Tax on SSB products in Asia. Singapore is reported to have introduced such tax in 2020 but no information is provided by Myanmar and Indonesia on Sugar Tax matter.

Table 1
Implementation of Sugar Tax in the Asian countries

Country	Year Imposed	Detail on the charges
Cambodia	1 April 2016	20% tax is imposed on soft drinks, along with alcoholic products and beer
Brunei	1 April 2017	Tax at B\$4 per10 litres for drinks that contain sugar of more than six grams per100 ml, 3 % tax for sugar and cocoa products
Vietnam	15 Aug. 2017	10% or 20%
Thailand	16 Sept. 2017	Charge of 0 - 1 baht per litre carbonated soft drinks will be taxed per litre according to sugar content per 100 ml
Philippines	1 Jan. 2018	Six pesos per litre for drinks that were sweetened with either just sugar or just artificial sweeteners (e.g. aspartame, sucralose, aspartame potassium) or both; or at a rate of 12 pesos per litre for drinks sweetened with just high fructose corn syrup or in combination with sugar or artificial sweeteners
Laos	1 April 2019	5% to 10% is imposed on soft drinks, sugary drinks, fruit juices and energy drinks.
Malaysia	1 July 2019	40 cent per litre imposed on sweetened beverages containing more than 5g of sugar or sugar-based sweetener per 100ml.

Different types of names are used by researchers to address the so-called Sugar Tax; SSB tax², fat taxes³, soda tax⁴, health-oriented food tax⁵ and soda and sin tax⁶ which has been used interchangeably. Based on a quick review of past studies, it is clearly highlighted that the implementation of a tax on SSB was meant to reduce obesity, diabetes and improve the cardiovascular system^{5,7,8}. In general, these studies had proven that the imposition of such a tax has been able to increase the quality of health in the countries. Although the imposition of sugar tax is a proven able to overcome health issues, there is also a negative aspect of this tax.

For instance, Cornelsen and Smith⁴ emphasize that imposing a sugar tax lead to the increased in prices of sugar-sweetened products. In terms of sugar intake, if the consumers are fond to satisfy their sweet cravings, the imposition of the sugar tax is seen not to give any meaning. For example, a study by Gonçalves and dos Santos⁹ discovered that the imposition of sugar tax does not give any significant changes in the quantities purchased as the manufacturer reformulate the recipe of production. Thus, to impose such new policies, the government should not only focus on the health effects but to also consider understanding the economic mechanism of the transformation, redistribution and the spillover effects to ensure that such new changes will yield meaningful outcomes.

While the evidence on the role of sugar tax to improve the quality of health is still scarce, it is important to look into the effective role of this tax in combating health issues. Although the imposition of sugar tax is expected to be positive for the health issues, it may provide a negative effect to the consumers due to the price hike. Therefore, in this study, we would like to review the necessity of sugar tax implementation in Malaysia and the potential effect based on the experience of other countries. This study will discuss the current issues in Malaysia, related studies that cover the discussion and review on the introduction as well as the effectiveness of sugar tax.

Sugar Tax in Malaysia

The imposition of the sugar tax by the Malaysian government is a part of its continuous effort to encourage a healthy lifestyle for its citizens due to the alarming data regarding the health issues.

Malaysia is reported to be the fattest country in South-East Asia as obesity and diabetes levels are on the rise and both are proven by the data in Table 2. Malaysia had experienced an increase in the prevalence of overweight (% of adults) from 2011 to 2016. This pattern continues and as per reported by World Health Organisation, 13.3% of Malaysians are obese, 38.5 per cent are overweight a. In addition to the highest proportion of diabetics (14.9%) in 2017 and the numbers keep increasing. It is believed that the factors that contribute to Malaysians' growing waistlines and health problems are the increase of household incomes and unhealthy lifestyles. However, the data of Malaysian expenditure on health and mortality from the critical disease is not as worrying as Laos with the total population of not more than 7 million. No data provided for 2017 onwards in the World Development Indicators database. Moreover, the data on Mortality from CVD, cancer, diabetes or CRD can only be obtained for the exact ages of 30 to 70, for the year 2015 and 2016.

Table 2
Data on Health Expenditure, Overweight, Morbidity and Mortality in Asian Countries

Description	Country Name	2011	2012	2013	2014	2015	2016
Population, total (in million)	Brunei Darussalam	0.39	0.40	0.40	0.41	0.41	0.42
	Cambodia	14.54	14.78	15.03	15.27	15.52	15.77
	Lao PDR	6.35	6.44	6.54	6.64	6.74	6.85
	Thailand	67.52	67.84	68.14	68.44	68.71	68.97
	Malaysia	28.65	29.07	29.47	29.87	30.27	30.68
	Vietnam	88.87	89.80	90.75	91.71	92.68	93.64
	Philippines	95.57	97.21	98.87	100.51	102.11	103.66
Current health expenditure (% of GDP)	Brunei Darussalam	1.86	1.85	1.90	1.91	2.39	2.34
	Cambodia	7.50	7.27	7.09	6.70	6.17	6.08
	Lao PDR	1.94	2.08	2.40	2.30	2.45	2.36
	Thailand	3.57	3.52	3.45	3.68	3.67	3.71
	Malaysia	3.39	3.55	3.57	3.77	3.90	3.80
	Vietnam	5.87	6.28	6.34	5.78	5.65	5.66
	Philippines	4.21	4.37	4.46	4.13	4.32	4.39
Prevalence of overweight (% of adults)	Brunei Darussalam	37.00	37.90	38.70	39.50	40.40	41.20
	Cambodia	18.80	19.40	19.90	20.50	21.10	21.70
	Lao PDR	21.30	22.10	22.90	23.70	24.60	25.40
	Thailand	27.60	28.60	29.60	30.60	31.60	32.60
	Malaysia	37.80	38.70	39.70	40.60	41.60	42.50
	Vietnam	15.30	15.90	16.40	17.10	17.70	18.30
	Philippines	24.80	25.30	25.90	26.40	27.00	27.60
Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%)	Brunei Darussalam	..	..	..	..	17.00	16.60
	Cambodia	..	..	..	..	21.30	21.10
	Lao PDR	..	..	..	..	27.10	27.00
	Thailand	..	..	..	..	14.60	14.50
	Malaysia	..	..	..	..	17.30	17.20
	Vietnam	..	..	..	..	17.30	17.10
	Philippines	..	..	..	..	26.90	26.80

Source: World Development Indicators (2019)

The worrying data about Malaysians is not surprising considering their habits and lifestyles. Based on the National Health and Morbidity Survey by the Institute of Public Health¹⁰ as reported in Table 3, despite the campaign of healthy lifestyles conducted by the government, Malaysian citizens are still considered as frequent consumers of sugary drinks regardless of their living area, gender, age and

level of education. As expected, the sugary drinks intake is higher for males rather than females and the lower secondary students consume higher than the upper secondary students which might be due to maturity factors. A study conducted by the Ministry of Health (MoH) also found out that nearly one in two Malaysians are overweight or obese. These statistics are vital to be put into consideration by the government as it is proven that there were significant associations between the excessive sugar consumption with high blood pressure and an undesirable lipid profile which is not good for the body¹¹.

Table 3
Carbonated Soft Drinks Consumption among Malaysian

Description	Statistic
Frequency of adolescents consumed carbonated soft drinks based on living areas	Rural 41% Urban 34%
% of Malaysian students had carbonated soft drinks at least once daily	36% or 1:3
Frequency of adolescents consumed carbonated soft drinks based on gender	Male 40% Female 32%
Frequency of school students consumed carbonated soft drinks based on level	32% Upper secondary school level 40% Lower secondary school level

Source: National Health and Morbidity Survey (NHMS) (2017), Ministry of Health Malaysia (2018)

In addition, the increase in obesity and diabetes rate may also be associated with the increase of sugary-food intake. Table 4 lists down the types of Malaysian favorite foods and sugar contents. The lowest sugar content is 1.25 tablespoon each which is still regarded high considering the volume of such food taken by Malaysians and this particular food does not subject to sugar tax as the Malaysian government only imposed a tax on processed sugary drinks. Adding to all of these factors, most of the traders highlighted that the price of the sugary drinks remains unchanged although sugar tax has taken place. The question is, does the sugar tax imposed by the Malaysian government meets the purpose of combating health issues if there are no significant effects on the prices which may influence the consumption pattern or it may be a good start to educate Malaysians as Malaysia is currently at the stage of educating consumers to drink less colored and sugary drinks. The imposition of this tax was in line with the suggestion by Ahmad et al.¹² following the outcomes of high SSB consumption among undergraduate students reported in their study.

Table 4
Sugar Content in Malaysian Favourite Foods

Type	Weight (g) each	Sugar Contains (g) each	No. Teaspoon of Sugar (1 Teaspoon =5g)
Kuih Koci	40-50	10-13	2.25
Kuih Keria	55-65	10-13	2.25
Seri Muka	110-120	10-13	2.25
Donat	45-55	7-10	1.25
Kuih Lapis	120-140	5-7	1.25
Lepat Pisang	65-75	10-13	2.25
Bingka ubi Kayu	70-90	18-25	4.25
Sate Ayam	150	18	3.5
Nasi Lemak	230	20	4
Nasi Dagang	250	25.5	5.1
Nasi Goreng	330	32	6.4

Source: Compiled by authors

Other Countries Experienced

Malaysia is not alone in facing the increasing trends of health problems which results in the initiative to introduce sugar tax as a tool to control sugar consumptions instead of using the tax as a revenue generation. However, the results on the effectiveness of sugar tax implementation in other countries cannot be generalised with Malaysia's scenario as sugar consumption sources may vary from other countries; and the level of the tax proposed and the current price setting may not provide a meaningful impact¹³. Caro et al.¹⁵ proposed that the current SSB tax imposed in Chile is not sufficient in tackling health issues, where a more comprehensive tax to enhance the overall effects of the policies for a healthier diet should be taken into consideration. These findings have been ruled out by Jevdjevic et al.¹⁴ where SSB tax may significantly improve health and most benefit the younger generations.

As the first country that introducing this tax, the effectiveness of sugar tax can be seen in the US as it is proven that SSB tax could substantially reduce Body Mass Index and healthcare expenditure and also increase healthy life expectancy¹⁶. Similar finding on the effectiveness of SSB tax was also reported in Columbia⁷, Mexico¹⁷ and sub-Saharan Africa¹⁸ where these studies confirmed that the government are in the right track for introducing such tax. Burki¹⁹ highlighted that since overweight and obese is a serious issue which is confirmed to be associated with eating habits, the government should put the levy on drinks manufacturers, not the consumers as they may promote and support a healthy lifestyle by producing a healthier version of products. The Lancet Oncology²⁰ also suggested to tax the manufacturers, although they might absorb any potential increase in price as charging the consumers might not be the panacea to combat the health-related issues.

While the most emphasized issue by the government in introducing SSB tax was on health-related issues, many studies also conducted researches to see the impact of this tax on prices. Alavarado et al.²¹ in the case of Barbados found out that the introduction of SSB tax resulted to an increased price of SSB products of up to 3 per cent. It is also believed that earmarking fat tax will contribute to the reduction of health insurance since a fraction of the expense has been allocated to healthier goods²². It is quite difficult for the government to promote healthy purchasing as it is also reported that not only the price of SSB-related products shows an increase in price, but it is also seen that the same category of products saw no tax change²³. Therefore, the increase in price of SSB-related products cannot be associated with the introduction of new tax as mixed-results were reported where some found an increase in price²⁴ and some with no significant changes in price²⁵. The most shocking issue, for some countries is the beverage industry to reduce the retail price and absorb some of the tax cost to outpace the potential dropdown in sales²⁶.

Another view that has been looked into by the pundits is the effect of SSB tax on consumption patterns. It is proven that SSB tax resulted in an increase in price which led to the decline in purchases of SSB-related products where consumers will move to non-tax products²⁷. This finding was in line with the prediction made by Adreyeva et al.²⁸ on the potential of SSB tax to reduce consumptions and further generate future revenue. Other studies that support the same outcome are Hagman et al.²⁹, Zhong et al.³⁰ and Castelló and Casasnovas³¹ where there is a need of creativity in introducing a new tax to make sure the effect is significant and the objective of its introduction can be achieved. However, the same outcome may not exist if the consumer has a strong preference for a particular product. Thus, they may just ignore the price increase and continue their normal spending³². Jaacks⁸ suggests that although the minimal impact is seen in purchasing healthy groceries, the government should continue this tax to educate the people for a healthier lifestyle as it is not an easy task. Guerrero-López et al.³³ highlight that the introduction of SSB tax is not only relevant in the changes in the consumption patterns but also affect the employment rates in the case of Mexico.

Conclusion

The solid evidence on the role of sugar tax in Malaysia may not be clearly seen as the implementation had only taken place for six months and it is usually difficult to see the impact in a short term period. We may see the impact of this policy changes on the purchasing pattern but to look into the deeper effect on health requires a longer period. Reviews of past studies show that for the association between SSB tax and better health, SSB tax may be able to reduce the consumption of SSB harmful products and also affect the price although a mixed result was also reported. Thus, the government should continue with the imposition of sugar tax in Malaysia even if the result for a short term is not convincing enough as educating for a better lifestyle is not an easy task. In fact, the introduction of this tax may not affect the consumption patterns so far as there is no significant price increase in SSB related products. However, it will be meaningful for further research to look into i) the price variation of SSB product pre, during and post sugar tax implementation, ii) sugar consumption patterns, iii) diabetes and overweight trends to see the association between sugar tax imposition and its effect on Malaysians. It is hoped that this study may open the eyes of the reader regarding the importance of sales tax introduction in Malaysia.

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Capacity of ASHA in the Prevention and Control of Malaria in High Burden Endemic Block of Rural Haryana, India

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Background

The Nuh district (Mewat) in Haryana had a high incidence of malaria.¹In spite of many efforts by the health authorities of government of Haryana, more than three fourth of malaria cases of the Nuh district had been reported from areas catered by PHC Ujina in 2018 (Source: Office of Civil Surgeon, Nuh). One of the Global Technical Strategy for malaria 2016-2030 is ensuring universal access to malaria prevention, diagnosis and treatment.²A systematic review found that effectiveness of community health workers in the community case management of malaria.³Another review found that health education interventions are effective and remain a valuable tool in community-based malaria prevention and control interventions.⁴

In India, Accredited Social Health Activists (ASHA), community health volunteers has been involved as one of the key functionaries in ensuring universal access of populations at risk to malaria control interventions.⁵ ASHA must be a resident of the village - a woman (married/widow/divorced) preferably in the age group of 25 to 45 years with formal education up to eighth class, having communication skills and leadership qualities. ASHA role is three-fold: to be a facilitator of health services and link people to health care facilities, to be a provider of community level health care, and an activist, who builds people's understanding of health rights and enables them to access their entitlements.⁶

The National Framework for malaria elimination in India was launched in 2016 with the goal "Eliminate malaria (zero indigenous cases) throughout the entire country by 2030". According to National Vector Borne Disease Control Programme (NVBDCP), following roles and responsibilities are assigned to ASHA in the prevention and control of malaria at community level. ASHA should promote the use of bed nets by explaining the importance of using Insecticide Treated Net(ITN). ASHA should also work in close coordination with Multi-Purpose Health Worker (MPHW) of the area to ensure adequate mobilization of the community for acceptance of Indoor Residual Spray (IRS) before the rounds.⁵

ASHA observing a case of suspected malaria must immediately initiate a diagnostic test by: microscopy of blood for malarial parasites and/or Rapid Diagnostic Test (RDT). ASHA are expected in supporting the health system in early case detection and complete treatment of malaria, especially in remote and inaccessible areas. ASHA also has involved in identifying warning signs of severe malaria and ensure timely referral of such cases to the nearest First Referral Unit (FRU).⁵

Objectives

The primary objective of the current study was to assess the capacity of the ASHA as a service provider in the prevention and control of malaria.

Methodology

A cross-sectional study descriptive study. The study was conducted in areas catered by Primary Health Centre, Ujina.PHC Ujina has total population of 72828as per routine surveysby the field staffs.i.e. multipurpose health workers / ASHAs which spread over 22 villages under four sub-centers.All ASHA under PHC Ujina who gave written informed consent were included in the study

After obtained permission from Institutional Ethics committee, data was collected using self-designed, pre tested, semi-structured interview schedule by interviewing ASHAs. The collected data were entered on an Excel spreadsheet and cleaned. Descriptive statistics were used to summarize all variables of interest in the study population. The quantitative variable was summarized using mean (S.D) and median (IQR). The qualitative variable was summarized using frequency and proportion.

Findings

A total of 30 ASHA from 22 Villages were interviewed. Median age of ASHA was 35.0 year (IQR: 30-39 years). Majority of ASHA had primary and middle school education (n=19; 63.3%) and only 30.1% (n=9) had completed matric/secondary and above education.

Of total 30 ASHA, all ASHA perceived malaria as main health issue. Majority of ASHA knew how people get malaria, seasonal variation of malaria, high risk vulnerable group for malaria, breeding places of mosquito which causes malaria, ways of prevention of malaria and benefits of Insecticide Treated Net. However, one in five ASHA only knew about the nocturnal biting habit of mosquito. Majority of ASHA trained for malaria control and their major source of knowledge were health inspector. See Table 1.

Fever was considered as a major symptom of malaria by all ASHA. Unconsciousness was considered as a major symptom of severe malaria by 73.3% (n=22) ASHA.

Table 1
Knowledge about Transmission, Risk Group of Malaria, Prevention of Malaria among ASHAsand Its Source of Information (N=30)

Variables	No	Percentage
How people got malaria		
Bite of infected mosquito	29	96.7
Others (dirty water)	1	3.4
Breeding place of mosquito which spreads malaria		
Rainwater pool, puddles, River bed, Irrigation channel, ponds	28	93.4
Others (Garbage, dirty water)	2	6.6
Biting habit of mosquito which spreads malaria		
Evening and night time	6	20.0
Biting time varies	24	80.0
Seasonal variation of malaria		
Yes	30	100.0
No	0	0.0
People at high risk of getting malaria*		
Pregnant women	26	86.7
Under 5 children	4	13.3
Ways of prevention of malaria*		

Sleep under bed net	29	96.7
Wear full clothes	18	60.0
Mosquito coil / cream	13	43.3
Insecticide spray	4	13.3
Others (Blood test and treatment for fever, Environmental measures)	26	86.7
Benefits of bed net treated with insecticide compared to untreated net*		
Kill mosquito/ Kill another insects/ Repel mosquito	29	96.7
Prevent malaria	25	83.3
Prevent other mosquito borne disease	3	10.0
Do not know	1	3.3
Nothing	0	0.0
Training for malaria		
Yes	29	96.7
No	1	3.3
Source of knowledge. *		
MPHW	3	10.0
Training	2	6.6
Medical officer	2	6.6
Others (Health Inspector)	29	96.7
Mass media	0	0.0
* Multiple responses allowed		

Table 2 depicts fever case management by ASHAs in the past month in her area. All ASHA were giving care to childhood fever in her area. Knowledge about diagnosis of malaria as doing RDT had known by all ASHA but only half (n=16; 53.3%) of them knew the peripheral smear in diagnosis of malaria. Out of 30 ASHA, 29 ASHA (96.7%) were doing RDT in their field area. All ASHA were checking compliance of antimalarial treatment and were checking completion of antimalarial treatment.

All ASHA were referring the child with malaria whose fever not subsided even after treatment with antimalarial. About half of the ASHAs (n=16; 53.3%) were asking the patient to take the antimalarial tablet after food during their field visit when someone vomited the antimalarial tablet. All ASHAs were involved in fever surveillance and awareness activity of malaria. All ASHAs participated in awareness campaign (Malaria Mukth campaign).

Out of 30 ASHA, 22 ASHA (73.3%) were accompanying IRS worker in the field. All ASHA faced resistance of IRS application in the community. Majority of ASHA (n=29; 96.7%) were checking home utilization of mosquito net. The major reason told to ASHA by study subjects for not using the mosquito net regularly were using fan (n=27; 90.0%), unavailability of mosquito net (n=15; 50.0%), feeling hot/ discomfort (n=13; 43.3%), no mosquito (n=8; 26.7%), net in bad condition (n=3; 10.0%), no space (n=1; 3.3%) and net causing irritation (n=1; 3.3%). Key IEC message delivered by ASHA regarding malaria prevention and control practices were: sleep under mosquito net (n=26; 86.7%), if suspected for malaria go for blood test and treatment (n=6; 20.0%), need of IRS (n=3; 10.0%).

Table 2

Case Management of Malaria by ASHAs as Service Providers in the Past Month in Their Areas. n=30

Variables	Frequency (No)	Percentage (%)
ASHA providing treatment for childhood fever		
Yes	30	100.0
No	0	0.0
No of under 5 children who were provided care by ASHA in the previous month		
< 5 cases in month	10	33.3
6-10 cases in month	13	43.3
10- 15 cases in month	7	23.3
Awareness of diagnosis of malaria*		
RDT	30	100.0
Peripheral smear	16	53.3
Types of malaria diagnosed by RDT		
Vivax and Falciparum	29	96.7
No	1	3.3
ASHA doing case management of fever by doing RDT		
Yes	29	96.7
No	1	3.3
No of days after antimalarial first started if RDT was positive		
Same day	30	100.0
Two or more than two days	0	0.0
Were you regularly checking the completion of antimalarial treatment once started		
Yes	30	100.0
No	0	0.0
Actions taken when someone vomited antimalarial table		
Advised to take tablet again with water immediately	6	20.0
Advised to take tablet again 1/2 hr later	6	20.0
Others (advised to take tablet after food)	16	53.3
Advised to skip medication	0	0.0
Do not know	2	6.7
ASHA action when child fever not subsided after antimalarial tablet		
Immediately refer child to PHC	30	100.0
Asked for compliance of treatment	0	0.0

*Multiple responses allowed

Discussion

Even though the minimum requirement of ASHA is eighth standard as per NHM standard, about one in four ASHA (26.6%, n=8) in the study area were having educational qualification below middle school in the present study. Dickson Shey et al found about one in ten community health volunteers were having

educational qualification below eighth standard.⁷ The reason for this disagreement maybe because female literacy level in the study area was low and hence relaxation of norms for ASHA selection in the study area.

Almost all ASHA have undergone training for malaria in the present study. Training of ASHA is proposed towards improving their knowledge and skills for malaria control as well as enhancing access to quality service provision at community level.⁸ Majority of ASHA knew at least one symptoms of complicated and uncomplicated malaria in the present study. This finding is in agreement with studies conducted on community health volunteers in Cameroon and Village malaria worker in Cambodia.^{7,9}

In the current study, Role of insecticide net in the prevention of malaria was known by majority of ASHA. Canavati et al found some misconception among village malaria workers about the role of boiling water in the prevention of malaria.⁹ Training of ASHA should focus on effective method of prevention of malaria like sleep under ITN, acceptance of IRS, prompt and effective treatment for febrile child and clear the misconception regarding transmission and preventive methods of malaria. All ASHA in the present study knew about RDT in diagnosing malaria. This is in agreement with the study on village malaria worker (99%).⁹ Majority of ASHA in the present study knew about the types of malaria diagnosed by RDT. ASHA receiving a case of suspected malaria must immediately initiate a diagnostic test by antigen detecting bivalent RDT or microscopy.⁵ Majority of ASHA were doing case management of fever in the study area by doing RDT. A study conducted in Nigeria found effectiveness of community health volunteer in the case management of malaria.¹⁰

All ASHA in the present study were following the patients on antimalarial treatment for compliance of treatment. This finding is in agreement with the previous study on village malaria worker (98.8%).⁹ ASHA worker has been trained that if the patient does not get relief from symptoms of malaria within 24 hours, and/or headache/fever continues to increase, the patient should report to the nearest PHC/CHC/hospital.⁵ All ASHA in the present study were referring the complicated cases of malaria to higher centre. In Uganda, introduction of Community Health worker provided a safety net for caretakers in rural areas to receive free treatment that they would not have previously received.¹¹

ASHAs are expected to create awareness on health and its social determinants such as basic sanitation and hygienic practices, healthy living, appropriate water storage practices, existing health services and the need for timely utilization of health services (like re-impregnation of ITN) in addition to her regular activities of providing a minimum package of curative care and arranging timely referrals.⁶ In the present study, all ASHA participated in malaria awareness campaign (Malaria Mukta campaign). A previous study in Cameroon found only 45% Community health workers distributing information leaflets on malaria prevention and control.⁷

In the present study, Majority of ASHA delivered IEC message of importance of sleeping under bed net in the prevention and control of malaria. A community directed intervention increased the utilization of bed net and increased access to health service in Nigeria.¹² All ASHA were facing problems of IRS acceptance in the community in the present study. Dickson Shey et al found less than half of community health volunteers (40.6%) faced such resistance for acceptance of IRS.⁷

Efforts were made to collect the desired accurate information by appropriate technique to minimize social desirability bias from respondents. The sample size of ASHA in the present study was too small to comment IEC/BCC activities of ASHA in the prevention and control of malaria.

Conclusion

The present study showed the capacity of ASHA in the prevention and control of malaria in the study area. Capacity building of ASHA is necessary for awareness generation, IEC/BCC activities, management and timely referral of malaria cases. In addition to the capacity building of ASHA, there is a need to ensure regular supply of RDT kits, antimalarial drugs, supportive supervision of ASHA and strong referral support.

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Did Mission Indradhanush (MI) / Intensified Mission Indradhanush (IMI) Increase Immunization Coverage? A Case Study of District from Haryana

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Abstract

The Ministry of Health and Family Welfare, Government of India launched flagship programme "Mission Indradhanush" in December 2014 and further in 2017 launched Intensified Mission Indradhanush aimed at fully immunizing more than 90 per cent of new-borns by 2020. A study was conducted in Gurugram District of Haryana to assess process adopted and opinion of 200 mothers regarding improvement in vaccination services. Coverage Evaluation Survey of 2018, jointly conducted by WHO and UNDP, post the implementation of MI and IMI in the district puts the FIC of district Gurugram at 83.8 per cent, an increase of 60.2 per cent. Better programme management, improved supervision and training to staff and micro-planning lead to tremendous improvement in the full Immunisation in the District.

Key Words: Mission Indradhanush, Intensified Mission Indradhanush, Full Immunisation Coverage, Open Vial Policy, Alternate Vaccine Delivery System, Vaccine Cold Chain Handler.

Introduction

Immunization has been the most effective strategy for reducing Infant and Child mortality in India. Through the 1980s, UNICEF worked with WHO to achieve Universal Childhood Immunization of the six EPI vaccines (BCG, OPV, diphtheria, tetanus, pertussis, and measles). Despite the Expanded Program of Immunization being launched by India in 1978, which was later replaced by the Universal Immunization Programme in 1985, the full immunization coverage rate of our country in 2016 was only 62 per cent.¹ Many studies conducted globally and in India underline factors such as management, efficient storage system, accessibility of services, training to staff, availability of human resources, facilities and infrastructure, socio cultural issues etc. A review published by WHO discusses the breakdown of vehicles and equipment, shortage of fuel, under supply of vaccines, needles and syringes. Irregular electricity supply affecting immunisation^{2,3}.

A study conducted in the rural parts of Anand District, Gujarat, India indicated that close to half the PHCs did not use a list of due beneficiaries for the next session. About 50 per cent of PHCs only had all vaccines available for administration, where 93.2 per cent had no plan for supportive supervision.⁴ At the primary health centre level, the main areas which need attention are staffing, Infrastructure, cold chain equipment, micro-planning, immunisation training, availability of data on vaccination.⁵ Another study using vaccination data from vaccination card of children aged 12-23 months in Haryana, found that the key to improvement in full immunization coverage is to monitor drop out at all stages of vaccination before completion of full course of immunization.⁶ Previous studies have shown the accessibility of vaccination sessions (both at the PHC and at Sub-centres), possession of a vaccination card were positively associated with vaccination status.⁷

The MoHFW, Government of India launched flagship programme “Mission Indradhanush (MI)” in December 2014, aimed to fully immunize more than 90per cent of newborns. In October 2017, Intensified Mission Indradhanush (IMI) was launched. It aimed at reaching 90per cent full immunisation coverage in districts and urban areas with persistently low levels.⁸The districts/urban cities with estimated no. of children who missed DPT3/Pentavalent3 >13,000 OR DPT3/Pentavalent 3 coverage <70per cent were further selected for Intensified Mission Indradhanush (IMI) drives. It aimed to reach 90% full immunisation coverage in districts and urban areas with persistently low levels.⁸

In the implementation of MI/IMI District is primary unit to assess immunisation coverage under the programme. The Gurugram District of Haryana state has shown exceptional improvement (60%), in Full immunization coverage post the MI and IMI campaigns.⁶ Therefore, a study regarding the implementation of the MI and IMI program in the district was conducted to gain insights into the processes followed during implementation of MI/IMI programs and improvements in the level and trends of immunization.

Methodology

A descriptive cross-sectional study, following mix method approach was conducted in the Gurugram district of Haryana during December 2019 to March 2020. Immunization service providers and mothers/caregivers bringing children less than 5 years of age were included in the study. Sample of 200 Mothers utilizing the routine immunization services at fixed/outreach sessions were selected.

From the district, Two CHCs and from the each selected CHC, 1 PHCs and from each selected PHC, 2 Sub centres were randomly selected. Thus, total 2 CHCs, 2 PHCs and 4 Sub-centers were selected. From each selected CHC and PHC, 30 mothers having children less than 5 years attending the immunization sessions were interviewed. From each of the Sub-center, 20 mothers attending immunization sessions were interviewed. Thus, a total of 200 mothers were interviewed to understand awareness of the beneficiaries regarding MI/IMI and their perception and practices regarding utilization of routine immunization services using pre-tested structured interview schedule. Mothers who were temporary resident and visitor in the selected area of the District were excluded.

District Civil Surgeon, District Immunization Officer, District Programme Manager, District Cold Chain Handler, 2 Medical Officer In-Charge of CHC, 2Medical Officer In-Charge of PHC, 8 ANMs at the Sub-centers, 8 ASHAs and 8 AWWs were interviewed regarding their perspectives on implementation status of MI/IMI in the district using structured and open ended schedule. To find out the level and trends of immunization after implementation of MI/IMI in the district, Coverage Evaluation Survey (2018),⁹ Integrated Child Health and Immunization Survey (2018), Routine Monitoring data from HMIS and physical records present with the office etc. were compiled. Statistical Analysis was done generating univariate and bivariate tables. Percentage was calculated where appropriate. Test of association with background characteristics was performed using Chi square test with the help of IBM SPSS ver. 20 and MS Excel 2016.

Findings

Level and Trends of Immunization in the District Gurugram

Figure 1 shows the full immunization coverage over the past 20 years according to various national level surveys. Report from District Level Household Survey 2 (2002-04) puts the FIC of Gurugram at 33per cent in 2002-2004 which increased to 71per cent according to DLHS-3 in 2007-2008. However, the National Family Health Survey 4 of 2015-2016 puts the FIC levels of Gurugram at 23.60per cent.

Coverage Evaluation Survey of 2018, jointly conducted by WHO and UNDP, post the implementation of MI and IMI in the district puts the FIC of district Gurugram at 83.8per cent, an increase of 60.2per cent.

Figure 1
Full Immunization Coverage of Gurugram, 2002-2018

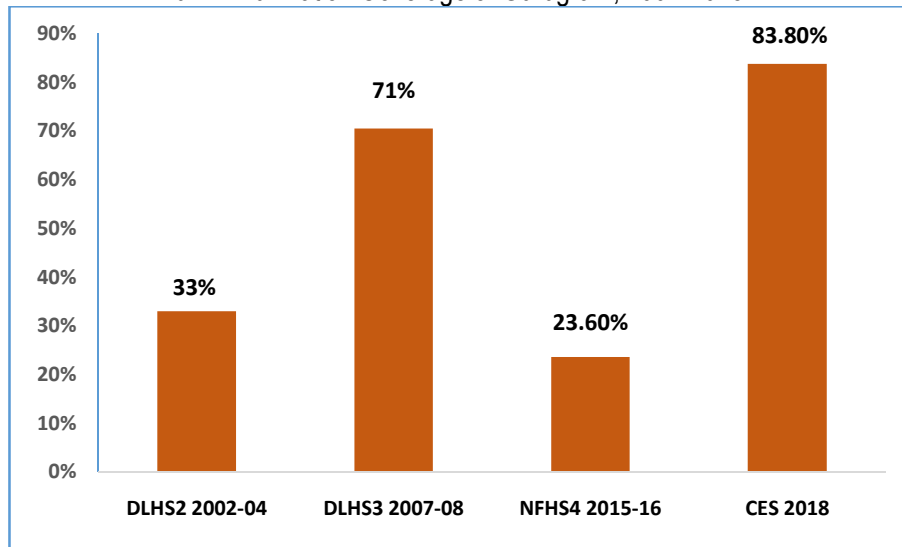
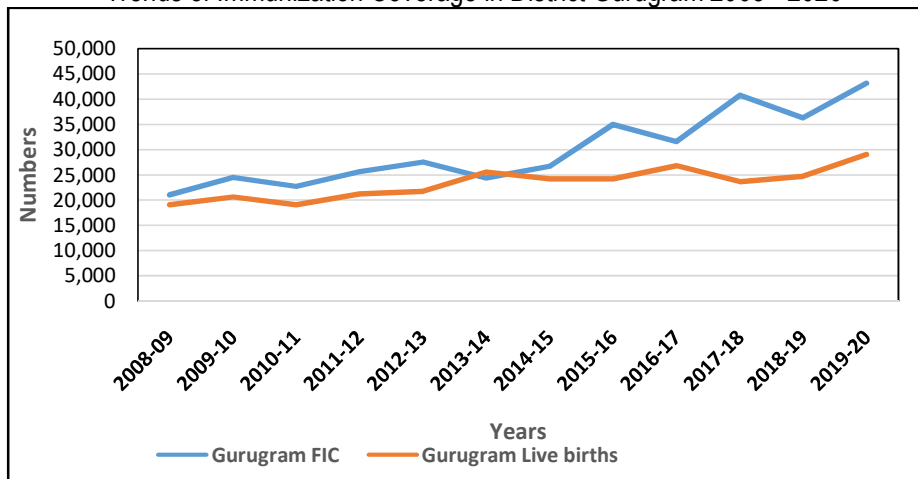


Figure 2 show the trends of vaccination coverage compared against the live births in Gurugram district derived from the HMIS data. As we can see that number of children being fully immunized increased every year, especially marked post 2014, which coincides with the implementation of MI in the district [HMIS entries of Haryana state 2008-2020].

Figure 2
Trends of Immunization Coverage in District Gurugram 2008 - 2020



Operationalization Process of MI/IMI

A seven-step process was developed to support district and sub-district planning and implementation of IMI, with staff at all levels receiving training, healthcare workers at the health facility, community-based workers (ASHAs), and non-health workers (AWWs).

According to the District Immunization Officer, door-to-door headcount surveys and due listing of beneficiaries were conducted and validated by supervisors for completeness and quality. The block level medical officers conducted session micro-planning, which identified new sites for conducting vaccination sessions, mobile teams were organised for remote areas and ensured that supplies were available. If too few staff were available at health sub-centres, additional staff were hired or brought in from other areas. Vaccine supplies were tracked using the Electronic Vaccine Intelligence Network and cold chain tracking programme and distributed using the alternate vaccine delivery (AVD) mechanism. To facilitate local implementation, flexible vaccination funds were used for personnel costs, incentives for staff, transportation, social mobilisation, and production of communication materials.

Additional sessions planned close to residences of targeted beneficiaries in HRAs and other identified areas during Mission Indradhanush rounds provided another opportunity to immunize children, especially the left outs and drop outs. Vaccination sessions were monitored. Administrative data collected by auxiliary nurse midwives were transmitted through the routine health management information system. External monitoring was carried out by supervisors, and assessments of small samples of households were made to validate childhood vaccination coverage. E-dashboards on mobile phones were used to collect monitoring data, which allowed real time aggregation of vaccination data.

Local monitoring was carried out by ANM's supervisors, district supervisors, and medical officers, with support from WHO and UNICEF monitors. During vaccination rounds, daily supervisor meetings reviewed the available data and discussed problems and solutions. During April-July 2015, a total of 64,137 children were immunized and 5,884 sessions conducted during the 4 rounds of Mission Indradhanush in the District. Under the Intensified Mission Indradhanush during October 2017 to January 2018, 427 immunization sessions were conducted with 3500 children received vaccinations, which was more than the number of target children identified as per the due list based on head count survey. There was an increase of 6.7 per cent in Full Immunization Coverage post the first two phases of MI, as compared to the earlier increase of 1 per cent per year. Ratio of sessions planned to sessions conducted was 97.5 per cent according to HMIS data.

Training under MI/IMI

The District Immunization officer (DIO) was identified as the district nodal officer for immunization training. The DIO was in-charge of training the MOICs of health facilities and they in turn were responsible for training the ANMs and ASHAs reporting to them. The DIO along with one Block Medical Officer were trained at the state level as master trainers. They conducted trainings for the medical officers at the district level. The medical officers acted as trainers for the Healthcare workers at the block level. The ANMs and ASHAs were trained in conducting head count surveys and making due lists for the additional sessions organized under MI/IMI. The trainings were conducted in a sequential manner in assistance with WHO. All the Vaccine and Cold Chain Handlers received a one-day refresher training on MI/IMI. All ANMs/ASHAs interviewed were trained under MI/IMI.

Logistics of Storage and Supply Systems of Vaccines and Equipment

Vaccine and logistics estimation – Estimation of vaccine and logistics requirements was done on the existing formats, based on the verified headcount of beneficiaries for the MI/IMI period. Logistics including auto-disable (AD) syringes and MCP cards available under the UIP were used for MI/IMI.

Reducing Vaccine Wastage –The maximum acceptable wastage for vaccines eligible for reuse under the Open Vial Policy (OVP) guidelines was taken as 10per cent.

Stock management – Standard vaccine registers were available and completely updated including vaccine wastage information, at all cold chain points with data entry in e-VIN within 24 hours of any transaction. Standard stock management protocols, including guideline-based storage in CCP, priority for issue based on expiry/VVM. Periodic physical verification of stock was followed.

Vaccine Distribution –Alternate vaccine delivery plans for the proposed IMI & RI sessions were prepared and finalized as per standard formats training.

VCCH training – A one-day refresher training for all VCCH was organized prior to MI/IMI based on the VCCH module.

Immunization Waste Management The immunization waste was sent to the PHC for disinfection and finally disposed of as per norms of the Central Pollution Control Board.

Availability of Equipment at PHCs

Table 1 shows the availability of equipment as per the IPHS standard at the two Primary Health Centres except Tracking Bag (at one PHC).

Table 1
Equipment Availability at PHCs Included in the Study

Sl.No.	Equipment	IPHS Guidelines for PHC	PHC 1 (Ganghola)	PHC 2 (Tigra)
1	Deep Freezer	1	Yes	Yes
2	ILR	1	Yes	Yes
3	Voltage Stabilizer	2	Yes	Yes
4	Thermometer	2	Yes	Yes
5	Temperature logbook	2	Yes	Yes
6	Cold Box	1	Yes	Yes
7	Ice Packs	8	Yes	Yes
8	Vaccine carrier	2	Yes	Yes
9	Hub cutter	2	Yes	Yes
10	Vaccine and logistics issue register	1	Yes	Yes
11	Immunization register	1	Yes	Yes
12	Tracking bag	1	No	Yes
13	Bleaching powder	As needed	Yes	Yes
14	BMW disposal bags	As needed	Yes	Yes
15	Routine immunization monitoring charts	1	Yes	Yes
16	Blank immunization cards (MCP cards)	As needed	Yes	Yes

The availability of equipment was as per the IPHS standard at the two Primary Health Centres except Tracking Bag (at one PHC). All necessary equipment like Deep Freezer, ILR, Temperature Log Book Cold Box, Ice Packs, Vaccine Carrier, Hub cutter, Vaccine and Logistics Issue Register, Immunization Register, BMW Disposal Bags, Tracking Bags, Immunization Monitoring Charts, MCP Cards etc were available. Besides above, Vaccine vials and diluters placed in zipper bags were also available. Immunization registers were regularly updated by the ANMs. The Table 2 shows that all the sub-centres included in the study were adequately stocked as per IPHS standards.

Table 2
Equipment Availability at Sub-Centres Included in the Study

Sl.No.	Equipment	IPHS Guidelines for Sub-centre	Available	Used
1	Ice Packs	8	Yes (4)	Yes (4)
2	Vaccine vials and diluents placed in zipper bags	Desirable	Yes (4)	Yes (4)
3	Hub cutter	1	Yes (4)	Yes (4)
4	Immunization register	1	Yes (4)	Yes (4)
5	Tracking bag	1	Yes (4)	Yes (2)
6	BMW bags	As per need	Yes (4)	Yes (4)
7	Blank Immunization Cards (MCP cards)	As per need	Yes (4)	Yes (4)

Besides above, Immunization registers were available and were regularly updated by the ANMs.

Provider's Perspective Regarding Immunization Services:

Human Resource and Training

Additional Medical officers and Healthcare workers were hired on contractual basis to bolster the ranks of the healthcare delivery system. Still lot of posts were vacant. The medical officers are not able to perform to their best of abilities due to work overload at PHCs. The ANMs were trained in managing AEFIs which was earlier lacking. However, refresher trainings of the ANMs is required. There was a lack of participation of Health worker(Male) in immunization. Medical officers commented that after implementation of Alternate Vaccine Delivery System (AVDS), ANMs can cover more area easily.

Monitoring of Immunisation during MI/IMI

The District Task force for Immunization was constituted and it monitored activities at the district level. There was daily reporting of children immunized by the ANMs which were compiled weekly at the block level and were updated monthly into the Health Management Information System at district level. AEFI surveillance was conducted and there were almost no cases of AEFI reported during the Missions.

IEC during MI/IMI

The resistance to immunization in some communities was tackled by the IEC campaign of MI/IMI. Local leaders were involved in promoting vaccination. According to some ANMs, there was an unprecedented surge in uptake of vaccination services. However, only 10per cent of the beneficiaries were attending the VHSND/UHSND which exposes a lacuna in the IEC dissemination and/or compliance.

Vaccine Logistics: The Civil Surgeon, DIO, MO and Cold Chain Handlers, informed no shortage of vaccines and icepacks, no frequent power outages and malfunctioning DF and ILRs. Funds for generators were allocated and a full time cold chain technician was posted in the district.

Perception of Beneficiaries Regarding Immunization Services

Background of Respondents

Socio-Economic and Demographic Characteristics and Vaccination Status

In our study sample, 82.5per cent of the respondents belonged to the Hindu religion. 67.5per cent belonged to general category. About 18per cent of the mothers and fathers were illiterate, 85per cent

mother were between 20-30 years of age. It is found that there is no statistically significant association of vaccination status with religion, cast, age of the mothers and father and Occupation for father.

Vaccination Status by Characteristics of Children

The table 3 informs that 60per cent of the children coming to the immunization sessions were male and 40per cent were females as compared to the 0 to 6 year-old children demography of Gurugram of 54.6per cent male and 45.6per cent female.

Table 3
Details of Children Availing Vaccination Services

Sl. no	Details		Number	Percentage
1	Age	Less than 1yr.	113	56.5
		More than 1yr.	87	43.5
2	Sex	Male	120	60
		Female	80	40
3	Birth Order	1 st	101	50.5
		2 nd	83	41.5
		3 rd	16	8
4	Place of Delivery	Home	15	7.5
		Institutional	185	92.5
5	Type of Delivery	NVD	135	67.5
		Caesarean	65	32.5
6	Immunization status	Appropriately immunized for age	158	79
		Partially immunized for age	42	21

Half of the children coming to the sessions were the first child of the family. 92.5per cent of the children had institutional births and hence had received the required dose of BCG, OPV-0, and Hep-B. 79per cent of the children were found to be appropriately immunized for age.

Awareness Regarding MI/IMI

Table 4 shows that 75per cent of the beneficiaries were not aware of MI/IMI at the time of interview. Out of the 25per cent (50 participants) of the participants that was aware, majority of them were informed by the ANMs, ASHAs and AWWs. Only 9per cent of the participants recalled seeing any IEC material and that was in the form of TV/Radio advertisements.

Table 4
Awareness about MI/IMI amongst the Sampled Population

Sl. No	Variables		Number	Percentage
1	Information about MI	Yes	50	25
		No	150	75
2	Source of Information	MO	0	0
		ANM	40	80*
		ASHA	34	68*
		AWW	44	88*
		Media	12	24*
3	Saw IEC Material for	Yes	18**	9

	MI	No	182	91
4	Did people visit for vaccination survey	Yes	183	91.5
		No	17	8.5
5	Availability of MCP card	Yes	174	87
		No	26	13
6	Site of Vaccination	Outreach session	184	92
		Fixed session	16	8
		Others	0	0
7	Child accompanied by	Mother	145	72.5
		Father	11	5.5
		Other	44	22
8	Alternate vaccination site	Yes	49	24.5
		No	151	75.5
9	Expenses on vaccination	Yes	6	3
		No	194	97
10	Advanced Information about vaccination	0-2 days	165	82.5
		2-7 days	29	14.5
		7+ days	6	3

*Percentages out of 50. **IEC in the form of TV advertisements.

Further, 87per cent of the respondents had MCP card. 92per cent of the beneficiaries availed the immunization services at outreach sessions near their home. All of the beneficiaries had information about the session sometime in advance.

Accessibility of Immunization Services

Table 5 describes that majority of the beneficiaries lived within 1 kilometer of the session site they usually attend. 97per cent of the respondents did not travel for more than ½ an hour to attend the session. 97per cent of the respondents walked to the outreach session or health facility to receive vaccinations.

Table 5
Access to Immunization Services in the District

Sl. No.	Variables		Number	Percentage
1	Distance from session site	Less than 1 km	167	83.5
		More than 1 km	33	16.5
2	Travel time taken	Less than 30 mins	194	97
		More than 30 mins	6	3
3	Mode of travel	Walking	194	97
		Other	6	3

Key Messages Received by Beneficiaries

Table 6describes that at least 97.5per cent of the beneficiaries attending the immunization sessions were informed by the healthcare functionaries about the name of the vaccine preventable disease.

Table 6
Details of Key Messages received by Beneficiaries After Vaccination

Sl. No.	Received Messages on	Number	Percentage
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1	Vaccine preventable diseases	Yes	195	97.5
2	Probable Adverse effects (AEFI)	Yes	195	97.5
3	Needed medicines to be taken	Yes	200	100
4	Date of next visit	Yes	195	97.5
5	Wait for ½ hour	Yes	200	100
6	Place for follow up in case of AEFI	Yes	200	100
7	MCP card filled and handed over	Yes	200	100

About 98per cent were informed about the possible Adverse Events Following Immunization and all of them were made aware of the place to follow up in case of an Adverse Event. 97.5per cent of them were told about the date of their next required visit. All of the respondents were made to wait ½ an hour at the session/facility for observation and appropriate medicines were given, if required.

Perceptions of the Mothers availing Immunization Services

Table 7describes that 73per cent of the respondents believed that the immunization services in their area have improved over the past 5 years. 87.5per cent were of the opinion that the behaviour and attitude of healthcare workers was very cooperative.

Table 7
Perception of the Beneficiaries about Immunisation Services

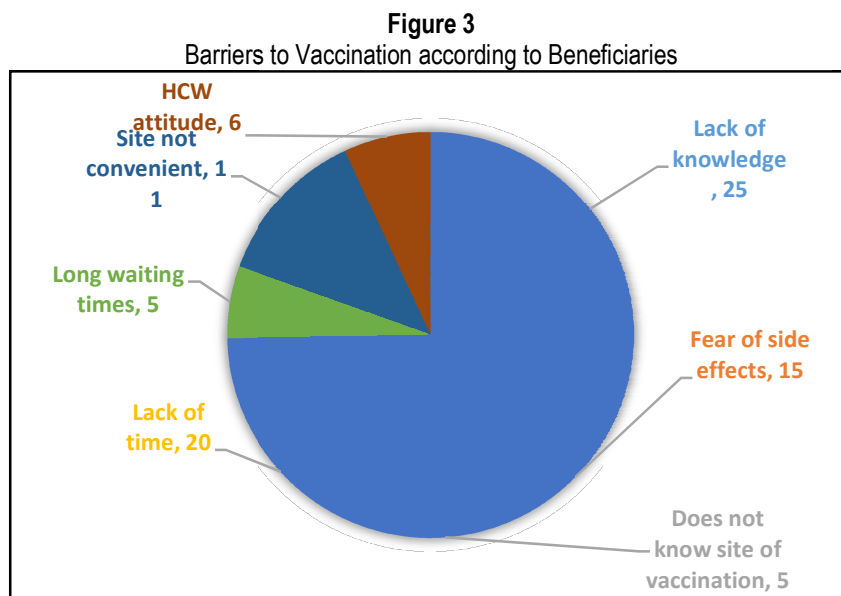
Sl. No.	Variables	Number	Percentage	
1	Thoughts about Vaccination services in the area	Excellent	88	44
		Good	112	56
		Poor	0	-
2	Behaviour and attitude of HCWs	Very Cooperative	175	87.5
		Somewhat Cooperative	25	12.5
		Non cooperative	0	-
3	Areas that need to be improved	Shortage of staff	-	-
		Frequency of sessions	-	-
		Advanced information	36	18
		Attitude of HCWs	10	5
		Other		
4	Would you recommend Vaccination to others	Yes	200	100
		No	0	-
5	Barriers to Vaccination	No knowledge	25	12.5
		Fear of side effects	15	7.5
		Does not know site of vaccination	5	2.5
		Lack of time	20	10
		Vaccine unavailable	0	-
		Long waiting times	5	2.5
		Site not convenient	11	5.5
		HCW attitude	6	3
6	Reasons for Vaccination	Awareness	111	55.5
		Motivation by family and friends	116	58
		Easy accessibility	72	36
		Motivation by HCWs	135	67.5
7	Immunization service in your area improved over the last 5 years?	Yes*	146	73
		No	54	27

8	What should be done to non-vaccinators	Counselling	156	78
		Accompany them to sessions	9	4.5
		Punishment	24	12
		There are no non-vaccinators	11	5.5

Mothers informed about the better attitude of HCWs, increasing number of people opting for institutional delivery, increased awareness about immunization and its benefits.

Barriers Faced by the Beneficiaries in Availing Vaccination Services

Figure 3 depicts barrier faced by mothers were mainly lack of knowledge, lack of time, and fear of side effects.



Discussion

Earlier studies noted that lack of attention to social determinants of health, including gender, education, employment, and the failure of the health-care system to deliver to those in need lead to existing health inequities in India.¹⁰ A WHO report regarding reasons for non-immunization found that lack of knowledge about which vaccines were needed and when to be given was responsible for high proportion of 'partial' immunization while fear of side effects was one of the major reasons for 'no' immunization.¹¹

A study conducted in Chandigarh showed strong positive relationship between positive relationship between mother's education and children's vaccination coverage.¹⁰ Another study conducted in Rajasthan found that mothers' familiarity with the public health system, their knowledge of the time of administration of individual vaccinations, mother's knowledge of vaccine preventable diseases has shown to be associated with vaccination.¹²

It is the success of innovative strategies under MI/IMI in our study that social barriers were neutralized in the present study. Findings showed that husband's education, wife's education, age of mother, birth order were, religion, caste and sex of the child were not associated with the vaccination status of children, such as complete and timely immunization which is different from the findings of other previous study in India when MI/IMI was not implemented.¹³ In our study, IMI showed that cross-sectoral participation can be effective in vaccinating those children at highest risk. Gurugram had four rounds of MI and four rounds of IMI leading to an increase of 60.6 per cent in Fully Immunized Children as compared to the pre MI/IMI levels. This translates into an annual increase of almost 15 per cent which is more than double the national annual increase in full immunization coverage of 6.7 per cent.

Issues regarding low immunisation highlighted by previous studies were addressed by MI/IMI through comprehensive IEC in the community and involvement of local leaders and influencers to make immunization a people's movement. Findings of the present study lead towards the conclusion that MI/IMI was successful in addressing the inequities in accessing vaccination services in Gurugram.

Recommendations

In the present study, Identification of HRAs, efficient and effective head count surveys, conduction of outreach and mobile immunization sessions in an intensive and phased manner, tracking drop-outs during micro-planning of immunization sessions besides well-trained staff, vaccines safety, equipment for vaccination and sterilization of syringes and needles; Better programme management and finally political commitment at all levels towards the immunization programme significantly contributed success of MI/IMI.

Ethical Clearance: *Ethical clearance of the study was obtained from the Institutional Review Board (IRB) NIHFV. Permission taken from Civil Surgeon of Gurugram for the conduct of the study.*

Limitations of the Study: *Mothers were interviewed during immunisation sessions, so opinion of mothers who did not attend the immunisation sessions could not be included in the study.*

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Spatial Variation of Maternal and Child Health Care Utilization among Scheduled Caste Women in India: A Systematic Review

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Abstract

Caste is a significant indicator that determines the utilization of Maternal and Child Health services (MCH) besides all the other socio-economic indicators. Caste system is deep-rooted in the Indian society. The Scheduled Caste (SC) population comprises 16.2 percent of the total population in India. Though SC populations were deemed untouchable during the earlier times; in the contemporary era, poverty, discrimination, and lower economic status are still profoundly discernible among this population group. These also result in inequalities in maternal and child health care utilization. Thus, this study aims at examining the spatial variation of MCH care services where the SC population is less likely to avail of MCH services. For this, systematic review of 13 full text literatures published between 2005 to 2022, has been done, adapting from PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis). This study contends that the spatial distribution of health services such as the absence of health facilities in areas with a high concentration of the SC population, can directly influence the access to maternal health care. Even when health facilities are present in the community, discrimination by the healthcare service providers significantly limits the usage of those facilities by the SC population. So, this study indicates that the government policies should be more inclusive in providing accessible, affordable, and equitable health care services among the disadvantaged social group of our country so that “no one is left behind” as per the guidelines of World Health Day 2022.

Keywords: Maternal health, child health, healthcare, Scheduled Caste, India.

Introduction

One of the topmost priority for community health programmes is maternal and child health (MCH) services. According to WHO (2019)¹. MCH services can be defined as “Promoting, preventing, therapeutic or rehabilitation facility or care for the mother and child”. This programme's main goals are to guarantee that every expectant mother has a healthy baby, to encourage the healthy development of mothers and their children, to provide family planning services, and to prevent both mother and child malnutrition¹. Though government has made several attempts to make substantial headway of existing situation of maternal and child health but the situation has not been changed so much. With an estimated 882 thousand newborn deaths, India alone accounted for one-sixth of the world's under-five mortality burden, according to WHO (2019)¹. In this same report, estimates that about 550 000 newborns died within the first 28 days of delivery. In addition to children, over 290 thousand women died worldwide in 2017 from complications connected to pregnancy and childbirth, with 35 thousand maternal deaths occurred only in India¹. Due to significant inter-state and intra-state disparities in a number of socioeconomic and demographic factors, including caste, level of education, economic status, customs and beliefs, age at marriage, age at childbearing, family size, birth interval, and others, India's maternal and child health situation is improving very slowly after the implementation of the

National Rural Health Mission (NRHM 2005). Caste is one of the most important determinants among them, having an impact on all socioeconomic and demographic characteristics, including the use of maternal and child health services². This is due to strong caste-based social structure in India³. The caste system in India is a very old one, dating back over three thousand years⁴. It has been passed down through the generations within the family and influences marriage, daily life, work, and people's professions⁵. There are large regional variations of caste system in India⁶. Caste continues to be a more pervasive form of segregation in the Indian society⁷. Because of this, women from lower castes continue to face discrimination when trying to access basic healthcare facilities⁸. However, there is a dearth of studies that examine the relationship between caste and maternal and child health in the context of India. However, to attain Sustainable Development Goal-2030 (SDG-2030), caste-based discrimination and inequities must be reduced, especially among the SC people who comprise 16 per cent of India's population⁹.

Objectives

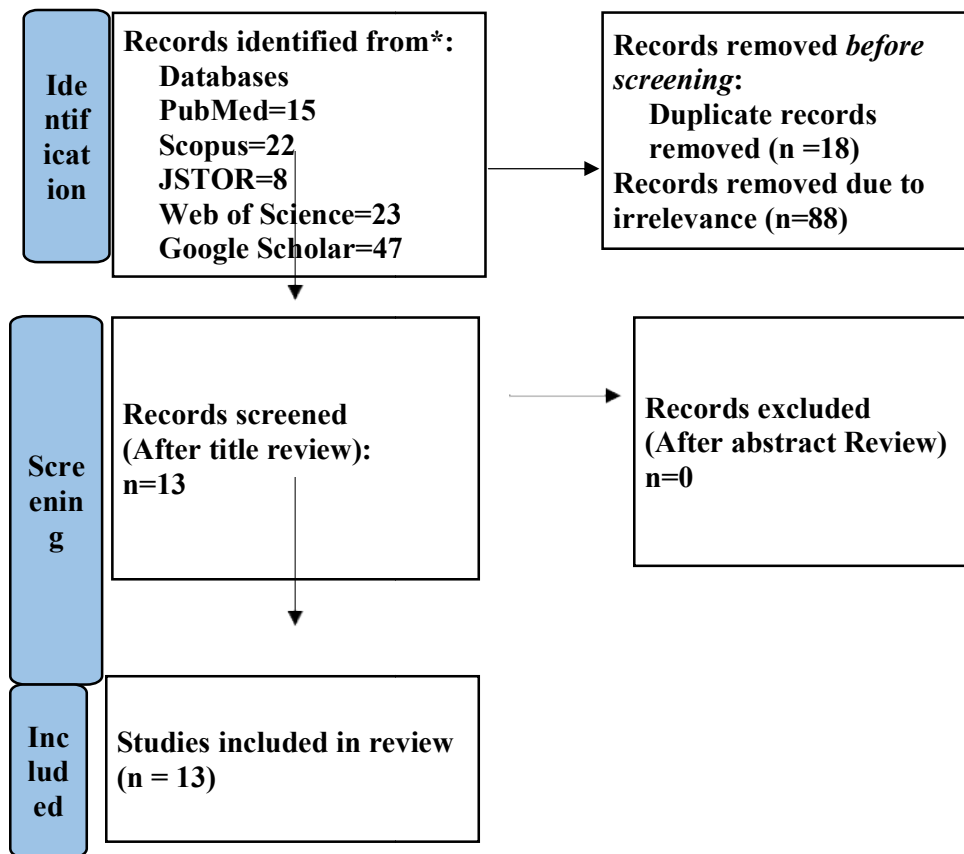
The primary goal of this study is to conduct a systematic literature review to evaluate the utilization of maternity and child health services among women from lower castes, particularly SC women. This study also raises more questions about the role of healthcare professionals and their treatment of lower-caste women when providing MCH services.

Methodology

A systematic literature review has been conducted by using an adaptation of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA),2020(Figure 1)¹⁰. The publications have been selected from six databases, namely, PubMed, Scopus, JSTOR, DOAJ, Web of Science, Google Scholars by using keywords such as *Caste, Maternal, health, child, Reproductive health, ANC or Antenatal care, Institutional Delivery, PNC or Postnatal care and India*. A total of 119 records have been searched from the databases- 15 studies from PubMed, 22 studies from Scopus, eight studies from JSTOR, 23 studies from Web of Science, 47 from Google Scholars and four from DOAJ. Among these, 18 duplicate and 88 irrelevant records have been excluded. Relevance of those articles could be justified from the title and main themes. Then the remaining 13 articles have been reviewed for this study and no single article has been excluded in the last stage. At the final stage, exclusion criteria have been noted such as the objectives of literature like tribal health, women's health, mental health, maternal morbidity, women's hypertension, and the health outcome of marginalized groups.

In terms of child health context, component of child health status such as specific child disease, child mortality has been included for this study. Broader context of child health could not be able to present here through PRISMA. The studies have been published between 2005 to 2022, and among these 11 articles have been published after the year 2010. All the included papers have been further analyzed to find out the association between caste impact in maternal and child health in India and also the association among antenatal care, institutional deliveries, postnatal care, child health, child healthcare, health-service providers.

Figure 1
 Selection of Articles, Adapted from PRISMA 2020 Flow Diagram
 Identification of Studies via Databases and Registers



Source: <http://www.prisma-statement.org/>

Findings

Optimal reproductive health conditions are integrally linked to maternal and child health. Several socio-economic factors in India, irrespective of gender, have an impact on reproductive health. It affects not just women, but also the welfare of their offsprings¹¹. Caste is a very complicated institution in India that directly and indirectly affects reproductive health¹². Caste and reproductive health have been linked here in two studies, one from Punjab and the other from Rajasthan. Reproductive health index demonstrates that reproductive health varies according to Caste⁶. The best reproductive health profile depends on prenatal care, which refers to pregnancy-related medical care provided by doctors, healthcare professionals working in a specific medical setting, institutional delivery by trained healthcare professionals, consumption of iron or vitamin supplements during pregnancy, correct diet, taking contraceptives, and consumption of the first feed to the newborn¹¹. Age at menarche, education level, and age at marriage are all significant socioeconomic factors that affect women's reproductive health in Rajasthan¹¹. For instance, SC women often get married at 14.3 years old in Rajasthan.

According to their customs, the average age of second marriage is 17.4 years old, and this period is known as *Guana* during which SC women used to visit their in-laws' homes after their first marriage. Due to this, Rajasthan's first conception occurs at an early age of 18.7 years. This demonstrates the lengthy window of childbearing age in later marriage years. Additionally, early marriage results in early

sexual activity which causes physiological alterations in newlywed women. This can occasionally result in severe problems with reproductive health¹³. So, Bharadwaj¹¹ asserted that education level has a significant impact on reproductive health profile since institutional deliveries and prenatal care are substantially correlated with education level in SC women. Whereas Sharma¹³ suggested that factors other than schooling, such as household income, the husband's work, and educational background, as well as the nature of the family, are also significant in predicting the reproductive health of SC women. This is because the majority of SC women earn no more than 50,000 rupees a year from their work. In Punjab, where more than 90 per cent of the SC population is landless, one-fourth of the SC (46.67%) and more than 10 per cent of SC women work as casual labour¹³. These factors impact the availability of antenatal care facilities, pregnancy loss, and home birth for SC women in Punjab. This demonstrates that SC women's low socio-economic status is associated with worse reproductive health status. Given that MCH has a greater impact on a larger percentage of women's health-related issues, it is a crucial component of reproductive health. Therefore, it is necessary to do a study into how caste influences maternal and child health.

Caste and Maternal Health

In the case of India, caste is a significant socioeconomic determinant with profound effects on maternal health. Maternal health is significantly impacted by social stratification based on caste¹¹. Four studies^{11,12,14,15} explicitly link caste to the availability of maternal health care. There are some key measures of maternal health, for instance, antenatal care, skilled birth attendant, institutional deliveries and post-natal care. Caste differentially impacts various social groups to access the maternal health care and this has been described below.

Caste and Antenatal Care

Caste has varying effects on how different social groups can obtain maternal health care. Caste is the hierarchy in a particular social situation, starting with the highest *Brahman, Kshatriya, Vaishya, and Shudras*¹⁴. SCs currently comprise roughly 16.08 per cent of India's population, placing them at the bottom of this social structure, as per the official caste classification¹². However, they have historically been denied access to all facilities and subject to discrimination¹⁴. Moreover, male counterparts control the socioeconomic circumstances and decisions that affect women. Therefore, the prenatal care of women from lower castes is impacted by numerous socioeconomic inequities. Prenatal care or ANC, is regarded in the current study as a crucial element of mother and child health care. It has assessed pregnant women's immunization status, including whether they had two doses of tetanus toxoid to prevent infections, if they took additional supplements such as iron and folic acid pills to treat anemia, and how often they lost their pregnancies or had stillbirths¹⁴. Only 12.4 per cent of SC women can have the full ANC or 4+ANC checkup (WHO recommended) in rural regions, compared to 32 per cent in urban areas, according to DLHS-3 (2007-08)¹⁶. This occurs because 61 per cent of women from other castes and more than 22 per cent of SC women are graduate-level educated, compared to only 8.3 per cent of SC women. Additionally, lower-caste women are very poor. Therefore, having a very low economic position makes it difficult to access medical facilities among them¹¹. Additionally, SC women in Ludhiana, Punjab, have a decreased likelihood of receiving antenatal care, which results in pregnancy loss for SC women¹⁷. In Uttar Pradesh, just 8.4 per cent of women of "other" castes receive prenatal care, compared to 20 per cent of SC women¹². According to the current study, only 70 per cent of women from scheduled castes in Punjab receive iron-folic acid supplements, compared to 84 per cent of women from upper castes. Additionally, SC mothers have lower immunization rates than general caste mothers.¹⁰ Lower caste women in the Maitha area of Uttar Pradesh are 2.5 times less likely to obtain a tetanus toxoid injection than higher caste women. Yet, there is no difference between them when it comes to taking iron supplements¹². According to the current study, Bihar does not

provide women from SC backgrounds with the full 4-and-over ANC check-up as advised by the WHO, which increases their risk of pregnancy¹⁵. For this, promoting MCH programme awareness among lower caste groups is crucial. According to the current study, scheduled caste women who are underprivileged are more likely than general caste women to use IFA tablets for an additional three days at a time¹⁷. So, there should be more maternal and child health care awareness programs so that lower caste women can utilize more MCH services.

Caste and Its Impact on Institutional Deliveries

According to DLHS-3, SC women from rural India are more likely to forgo receiving maternal health care¹⁶. This results in only 32 per cent skilled delivery in rural India among women due to lower family income, education, and poor medical facilities¹⁴. In cases of institutional delivery, upper-caste women in Uttar Pradesh are five times more likely than lower-caste women to be attended by trained birth attendants. Women from lower castes are normally delivered by traditional birth attendants. In UP, this customary birth attendant is a *Dai* or *Dhankuni*, who typically comes from a scheduled caste family¹². The place of institutional delivery is determined by economic status. Due to financial assistance, the majority (86%) of SC women in Punjab who had institutional deliveries opted to give birth at a government hospital rather than a private one. According to the NFHS-4 (2015–2016) survey, this scenario has changed slightly in Bihar, where 78 percent of institutional deliveries are attended by skilled birth attendants, compared to 84 percent of deliveries in the General Caste category¹⁹. There was only 11 percent institutional delivery among SC women, according to NFHS-3 (2005-06). Due to awareness campaigns, institutional deliveries of lower caste women are now 2.2 percent more common than their general caste counterparts¹⁷. Thus, it suggests that greater awareness and socioeconomic advancement can contribute to expanding mother and child health services.

Caste and Post-natal Care

Post-natal care utilization varies across social groups depending on factors such as women's education, husbands' education, domicile, wealth quintile, and regional differentiation. In rural areas, just 19.3 per cent of women with an SC background obtain postpartum care, compared to 23 per cent of women from other caste backgrounds¹⁴. Due to the lack of health professionals and the higher presence of private hospitals where SC women cannot afford this care, the percentage of the SC population in urban areas using post-natal care services is lower. At the same time, 34 per cent of people from other caste categories receive postpartum care in a city. Additionally, the early age of first pregnancy and the fact that women from SC backgrounds cannot complete college create barriers for them to access and use this services¹⁴. In UP, Dalits or persons from lower castes are less likely to obtain postpartum care than people from the General caste category. The situation is worst for SC women living in the poorest households²⁰. In Bihar, no woman from an SC family receives the WHO-recommended 24 hours of observation and 4+ PNC check-ups following a clinical birth. Although ANM and ASHA can occasionally assist in resolving postpartum issues, complete form PNC is not provided to SC women in Bihar¹⁵. Additionally, compared to the general group (86.67%), SC women are less likely to practice breastfeeding (78.30%). This shows that SC women are more susceptible to pregnancy-related health risks long after delivery due to improper use of PNC¹³.

Caste and Child Health Status

Socio-economic differences across caste groups impact child health. For historically marginalized communities, there are several obstacles to using and accessing health care services¹². The current study demonstrates that the lack of healthcare facilities in locations with a significant concentration of SC residents can directly affect access to healthcare²¹. The infant mortality rate is 1.4

times greater among SC women than among women from the forward caste, demonstrating the significant caste-based divide in child mortality among children under the age of five, according to this study. Due to the poor living conditions and lack of education experienced by two-thirds of SC women, this inequality has grown with time²¹. Additionally, a child from a lower caste has five months less chance of surviving than a child from an advanced or general caste. Poor health caused by poor socioeconomic conditions results in under five mortalities across lower caste groups. According to Luke & Munshi²², (2007) children is used to be sent "outside," or to a private clinic or traditional healer, for their uncommon illnesses, which force them to spend more money on children's health in the Tamil Nadu tea estate¹⁵. This is because of the inferior social network and capital. As a result, they are unable to receive regular checkups, and it has an adverse effect on children's health.

Majority of young children under the age of five experience diarrhea and anemia as a result of their poor health. In India, diarrhea is the third most common cause of child death, killing an estimated 1.1 lakh children annually²³. Mother's health information is crucial in this situation because it may help in preventing or controlling the disease. The current study reveals a significant caste-based knowledge gap among mothers in both rural and urban settings, which has a negative impact on diarrhoea-related child fatalities. In comparison to women from lower castes, upper castes women in metropolitan areas, for instance, have better access to education, more information, and better exposure to current information and technology, which contribute to considerable knowledge and help with access to the health network²⁴. Therefore, every 22 women who have some understanding of diarrhoeal treatment such as the consumption of ORS, water, etc., can prevent their child from dying from diarrhea. Rural areas have a higher percentage of lower caste women than urban areas, and these women incur more infant deaths than upper caste women¹⁶. Additionally, caste-based differences in under-5 mortality are more prevalent and frequent in several regions of India. According to Bora et al.²⁵, there is still a high burden of under-5 mortalities among the lower castes in India's high-focus states or Empowered Action Group (EAG) states like Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttara Khand, and Uttar Pradesh, even after the implementation of the National Rural Health Mission in 2005.

The extent of household wealth affluence (65%) and mothers' educational attainment (18%) are two important factors that contribute to the larger mortality disparity (76%) between SC and non-SC children. As, low level education limits the awareness of healthcare services²⁵. Numerous co-morbidities in children, including stunting, wasting, child mortality, and anemia, are caused by these caste-based health inequities. According to the current study on caste and anemia, women from lower castes are more likely to live in India's lower socioeconomic classes. For this reason, they have very unfavorable living conditions and unhealthy lifestyle choices, such as maternal smoking and unhealthful eating patterns²⁶. Additionally, they use healthcare services very infrequently, which could affect their practice of avoiding iron supplements, which worsens child anemia in women of lower castes²⁶. According to this study, open defecation increases in local neighborhoods where "untouchability" is practiced¹⁹. Children that reside in such communities are, therefore, often shorter in height. The norms that separate the untouchable caste from the non-untouchable caste obstruct the advancement of the sanitary system, exacerbating a health issue that is hazardous to everyone. In rural India, open defecation increases the spread of infectious diseases that have a negative impact on children's health and cause shorter heights in children from poorer castes¹⁹.

Caste and Child Health Care

A dearth of literature in India only addresses caste and child health. Health disparities for children are also impacted by caste. Caste influences how often children receive medical treatment. Child health care includes newborn care, postpartum checkups, immunization status, breastfeeding, sugar water and honey, and postnatal care. The current study demonstrates that even though the fact that

breastfeeding is an essential component of a newborn baby's diet for those under six months old because it can help avoid infant malnutrition, very few SC women in Rajasthan used to give their newborns sugar water and honey after birth¹¹. Although non-SC women in Punjab have a higher immunization rate, at 95 per cent, one-fourth of children from SC backgrounds are still unvaccinated. The difference in newborn vaccination rates between lower and upper castes is particularly large in Uttar Pradesh²⁰. Therefore, inadequate newborn healthcare among women from scheduled castes resulted in catastrophic health consequences that could result in death.

Perception of Healthcare-Providers and Caste

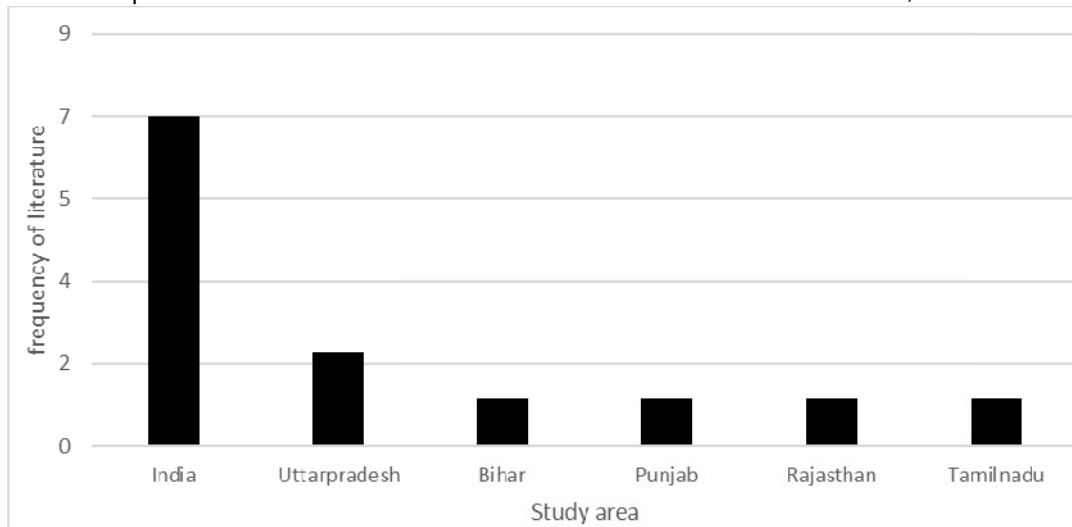
The solution to the difficulty in accessing healthcare utilization services lies with the healthcare providers. Several issues with the underutilization of maternal and child healthcare services can be resolved by the availability of healthcare personnel, particularly in rural areas where there is a significant concentration of people from lower castes²⁷. But caste also impacts getting good medical care from healthcare professionals²⁷. Accessibility, affordability, and quality of health care providers in Bihar, particularly Accredited Social Health Activists (ASHAs), who are essentially recruited in every locality to provide adequate information regarding ANC, PNC, institutional delivery, immunization, etc., are very poor and inconvenient for lower caste women¹⁵. Here, SC women frequently stated that ASHA used to stay away from SC areas, and they hardly ever visited SC districts. Even though most SC women in rural Bihar still completely rely on ASHA, they frequently refuse to provide them with the correct information regarding health incentives like JSY (*Janani Suraksha Yojana*), the emergency ambulance number of the local PHC, or ANC. Most of the time, they used to charge SC women extra to supply them with those basic amenities and prioritize the higher caste individuals over SC women¹⁵. According to the current study, doctors, nurses, ASHAs, and ANMs (Auxiliary Nurse Midwives) typically come from upper-caste backgrounds. Because of the issue of physical interactions, health personnel from the higher caste used to decline to check on or visit the lower caste women in the Maittha area of Uttar Pradesh¹². Because it is strictly forbidden to touch a lower caste person's body, this puts obstacles in the way of lower caste women giving birth in institutions²¹. This demonstrates the importance of people's perceptions, mentalities, and levels of understanding across social groups in resolving these issues and ensuring equal access to maternal and child healthcare services¹².

Geographical Distribution of Literature

The primary focus of all the studies have been considered for analysis is India, followed by Uttar Pradesh, Bihar, Punjab, Rajasthan, and Tamil Nadu. These are mostly illustrating caste affiliation and its effect on maternity and child healthcare services. Caste variation and its impact on reproductive health have been studied in greater detail in the National Family Health Survey-4 and District-level Household Survey-3 (2005–06)^{16,18}. Kumar & Gupta¹⁴ have claimed that there is huge differentiation of maternal and child health care service in intra and inter-caste level. This variation is exclusively attributable to differences in birth age, level of education, domicile, and socioeconomic standing. Women from Specially SC are unable to get maternal health services because of their inferior socioeconomic status, low level of education, and lower caste. Women from lower castes are at higher risk for health problems due to the inaccessibility and underutilization of these facilities. Poor living conditions, a lack of health knowledge, and unhealthy behavior are all effects of caste-based social inequality that have an impact on child anemia²⁶. The practice of untouchability by local residents encourages more open defecations, which spread infectious viruses and have a negative influence on child height in India²⁵. Social inequality has an impact on the community sanitation system. In addition to caste differences, institutional deliveries and access to prenatal care cause a higher rate of under-five deaths among lower castes²⁸. The problem still exists among lower caste people in high-focus states, including Jharkhand, Chhattisgarh, Madhya Pradesh, Orissa, Assam, Bihar, and Uttar

Pradesh, even after the implementation of the National Rural Health Mission (NRHM) in 2005. Because of this, our nation is still distant from achieving Sustainable Development Goal No-3 (SDG-3)²⁵. Bharadwaj¹¹ (2010) has claimed that a woman's level of education, her age at marriage, and her age at her first childbirth are all directly related to her reproductive health profile. Low-caste women have a higher fertility rate and worse reproductive health than women from higher castes due to early marriage and early first conception. Due to low educational attainment, low income, and subpar standard of life, women from scheduled castes in Punjab are less likely to obtain all maternal and child health care services¹³. The Dalits are the most socially disadvantaged group in Uttar Pradesh compared to other castes. For this, lower caste women frequently struggle to receive the appropriate care from service providers. Women from SC are unable to receive antenatal care services¹². Not only ANC, PNC and newborn care is also affected by these caste disparities in Uttar Pradesh²⁰. Scheduled Caste Mothers said in the Bihar, they did not receive PNC from ASHA or ANM and that general caste women had far better treatment than SC women¹⁵. For this, there needs to be much more accessibility, affordability, and availability of this service. According to Parakshi et al., the maternal and child health programme is becoming more widely known, which may make its services more readily available to women from lower castes¹⁷.

Graph 1
Spatial Distribution of Literature on Caste and Maternal and Child Health, 2005-2022



Source: Generated by authors

Graph 1. demonstrates that nearly seven research focused on the study of India in this manner. Among them, five research have concentrated entirely on caste and child health, one study has examined how caste differs in terms of maternal health, and another study has concentrated on the relationship between caste and awareness of maternal and child health. Regarding the care of newborns, mother's health, and the effects of caste, Uttar Pradesh has two records. There has been one publication each in Bihar, Punjab Rajasthan, and the southern state of Tamil Nadu. Surprisingly, there hasn't been any research on caste's impact on maternal and child health in West Bengal. However, after Uttar Pradesh, West Bengal has the second-highest percentage of people who belong to the SC (10.7%), according to the Indian Census, 2011. Most of the reviewed literature has provided evidence of the link between maternal and child health and lower caste populations, including SC, ST, and OBC. Only two studies^{12,15} entirely focus on the SC community and their perspectives on maternal and child health care. This shows that despite the SC population making up 16.8 per cent of India's population, there aren't many publications about maternal and child health care utilization among them. Therefore,

further in-depth research on the SC population in a broader spatial context needs to be carried out to learn more about the scenario of mother and child health care of them.

Conclusion

Thus, this study reveals that maternal and child healthcare utilization among SC women is still a barrier to achieving SDG-3, 2030. Continuous development and ground-level analysis only can better utilization of maternal and child healthcare services. Spatial variation of different demographic factors only helps to identify the gap within the states and within the districts of India among the SC Population. Besides, there are so many sub-castes that should be taken into consideration as an analytical category because significant discrimination exists within the caste groups or *jati*²⁹. Spatial variations of socio-economic factors among the caste groups are very important factors which create regional inequality of reproductive health status of women⁶. Given the fact that, there should be more inclusive policies for lower caste population, especially on SC population. More focus should be given on EAG states. Besides, there is a need to strengthen the quality of ASHA workers for getting more connected with marginalized people²⁸. Caste dynamics, other community factors, and limited availability of program resources are needed to be addressed at the earliest for improving their efforts and quality³⁰. But we should not overlook the lower caste women of better performing states like Kerala, Tamil Nadu, and Andhra Pradesh as only lower caste people have very low access to health care utilization in those states also. So, Government and Policy makers must bring more inclusive policies for a better society and also achieve SDG Goal-3 very soon.

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Knowledge, Attitude and Practices (KAPs) regarding Self-care Nutrition among Home-Isolated COVID-19 Patients in Rural Northern India: A Cross-sectional Study

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Abstract

Any anti-pandemic measure's impact is determined by a large and small scale of knowledge, attitudes, and practises (KAPs) of the infected patients which influences home-bound patients in self-care nutrition arbitration. The study is aimed at ascertaining the Knowledge, Attitude, and Practices (KAPs) in relation to the self-care nutrition among home isolated COVID-19 patients in rural northern India. A cross-sectional study among COVID-19 home-isolated patients of rural population was approached. Self-structured e-questionnaire based on Knowledge, Attitude and Practices pertaining nutrition among 150 purposely selected respondents were administered. There are more symptoms and other health issues related to COVID-19 than younger patients. It is necessary to increase participant knowledge in order to correctly include nutrient-rich meals.

Keywords: Self-care, Nutrition, Home isolation.

Introduction

The coronavirus (COVID-19) pandemic began in Wuhan, China, in December 2019. The virus quickly spread from China to the rest of the world. The World Health Organization (WHO) proclaimed a public health emergency of international concern (PHEIC) in order to control the rapid spread of this virus from person to person. The government declared a total lockdown on March 24 to combat the rapid increase in COVID-19 cases in Indian states. Passengers traveling from abroad to Punjab provided the first positive report with an early diagnosis. Global shortages of medical and safety equipment, as well as pharmacological treatment, have resulted in a noticeable decline in the effectiveness of most health care personnel. As a result, home isolation strategies have become critical for dealing with the massive number of covid-19 infected people. Furthermore, as part of the executive procedure, guidance on personal hygiene practices, disinfected isolation space, and ideal nutrient requirements should be included.

Coronavirus symptoms and comorbidities related to age, sex, and other factors. The severity of COVID-19 can be increased by coexisting conditions such as hypertension, diabetes, cerebrovascular disease, heart disease, lung disease, cancer, chronic renal disease, and chronic liver disease. The frequency of the most prevalent clinical symptoms, such as fever, cough, drowsiness, anorexia, dyspnoea, chest tightness, haemoptysis, diarrhoea, and stomach pain, is correlated with the severity of the illness¹. Any anti-pandemic measure's impact is determined by a large and small scale of knowledge, attitudes, and practises (KAPs), which influences home-bound patients in self-care nutrition arbitration. Indeed, as evidenced by a large number of virus cases, public education has been identified as one of the most intensive accomplishments that can undoubtedly aid in successful pandemic control and outbreak

prevention. As a result, government health organizations began to take significant steps to provide the general public with precise and reliable information on Coronavirus.

Objective

The primary objective of this study is to look into the KAPs for self-care nutrition among the home-isolated COVID-19 patients in rural northern India. Although health organizations hope that control measures will slow the spread of this epidemic, their effectiveness will be dependent on individual and societal knowledge and awareness.

Methodology

Research Design: A cross-sectional study was designed to evaluate self-care nutrition Knowledge, Attitudes, and Practices (KAPs) among home-isolated COVID-19 patients. For this research, a local language translated Google form was created and used for data collection for two months from May to June 2021.

Inclusion and Exclusion Criteria: A total of 150 men and women were purposefully chosen for this study. The following are the enrolment requirements for each participant: (1) must be 18 or older; (2) must live in rural areas of the border district of Tarn Taran in the Indian state of Punjab; (3) must be tested positive for COVID-19; and (4) must be completely home isolated according to government home isolation guidelines. The Google Docs questionnaire was translated into Punjabi and the feedback of participants was documented via telephonic administration.

Questionnaire:

(1) *Socio-demographic characteristics:* Participants' socioeconomic status was assessed by using the Modified Kuppaswamy Socio-Economic Status (SES) scale, such as gender (male/female), age (18-30 years/30-45 years/45-60 years/ >60 years old) and marital status (married/unmarried/widow/divorced).

(2) *Medical records:* Days of complete home isolation were classified into three categories i.e. less than 5 days, 5-12 days, or more than 12 days. Medical history such as heart disease, diabetes, renal disease, a blood disorder, and no comorbidity was also recorded.

(3) *Nutrition knowledge learning-related attitude and practice:* A self-structured e-questionnaire based on Knowledge, Attitude, and Practices (KAPs) pertaining to nutrition among home-isolated COVID-19 rural respondents were designed to gather the data in quantitative domains. A nutrition knowledge pertaining questionnaire concerns the food component preference-related knowledge, home remedies-related knowledge, eating citrus fruits-related knowledge, and addition in diet-related knowledge. Nutrition learning attitude had measures such as satisfaction with dietary intake, adopting any changes in eating routine, observation in the body, and being willing to take any nutrition advice, the following items measured nutrition-related practices i.e. modifying daily routine, changes in food taste preferences, meal distribution per day, changes in water intake, and changes in mental wellbeing.

Statistical Analyses: Data were exported from the Google form into Microsoft Excel for sorting and coding before being cross-checked for redundancy. To compare variables, descriptive statistics such as frequency and percentage, and the chi-square test as well as fisher's exact test, were used. Stata version 16.0 was used to interpret the results, and statistical significance was determined at $p < 0.05$ and $p < 0.01$.

Findings and discussion

Socio-demographic characteristics: The study included 150 Covid-19 patients who were confined to their homes. The vast majority of participants (62.7%) were men, and 106 (70.7%) were married. The same percentages of patients (27.3%) were between the age group of 30-45 and 45-60. The majority of family heads had a high school diploma or higher, and half of the household heads were unskilled workers.

Table 1
Socio-demographic Characteristics of Home-Isolated COVID-19 Patients(N=150)

Variable	Frequency	Percentage
Gender		
Male	94	62.7
Female	56	37.3
Age (year)		
18-30	40	26.7
30-45	41	27.3
45-60	41	27.3
>60	28	18.7
Marital status		
Married	106	70.7
Unmarried	38	25.3
Widow	5	3.3
Divorced	1	0.7
Education status of family head		
Illiterate or primary	48	32.0
Middle	8	5.3
High school or post-high school diploma	70	46.7
Graduate or post graduate	20	13.3
Professional degree	4	2.7
Occupation of family head		
Clerical, shop/farm owner	24	16.0
Professional	3	2.0
Semi-professional	16	10.7
Semi-skilled worker	7	4.7
Skilled worker	16	10.7
Unemployed	2	1.3
Unskilled worker	82	54.7

Conceptions regarding COVID-19

The majority of participants (74.0%) completed their home isolation period between 5 and 12 days, with only a few patients (6.0%) finishing in less than 5 days. High-grade fever and body pain were the most common symptoms in patients (44.7 %), followed by cough and breathing difficulty in 44 (29.3 %). In addition, a few female participants (8.0 %) reported mental stress. In contrast, 27 (18.0 %) of respondents were asymptomatic. The majority of respondents (70.7%) had no comorbidity, while a similar percentage (11.3%) had diabetes and hypertension, and 6.7% had heart disease (Table 2).

Table 2
Conception towards COVID-19 about Isolation Period and Symptoms (N=150)

Home isolation period completed at the time of the interview	Total	Percentage
5-12 days	111	74.0
Less than 5 days	9	6.0
More than 12 days	30	20.0
Symptoms		
Cough, breathing difficulty	44	29.3
Fever, body ache	67	44.7
No	27	18.0
Stress	12	8.0
Any comorbidity among		
Diabetes	17	11.3
Heart disease	10	6.7
Hypertension	17	11.3
No comorbidity	106	70.7
Total	150	100

Percentage indicated in parenthesis

Association of Age of Patients towards Conceptions on COVID-19

The home isolation period of 5-12 days was longer among the 18-30 and 30-45 age groups, and this finding was statistically significant ($p < 0.05$). Diabetes, heart attacks, and hypertension were all more common in the 45-60 and >60 age groups, and the difference was statistically significant at $p < 0.01$. The most common presenting symptoms reported by the 18-30 and 30-45 age groups, according to the study results, were fever and body ache, and the result was statistically significant according to chi-square test results ($p < 0.05$) (Table 3).

Table 3
Age-wise Association of COVID-19 Patients in Home-Isolation and Their Conception (N=150)

Variable	Age				p-value
	18-30	30-45	45-60	>60	
Home isolation period was completed at the time of the interview					
5-12 days	35 (87.5)	32 (78.1)	26 (63.4)	18 (64.3)	0.042*
Less than 5 days	3 (7.5)	2 (4.9)	3 (7.3)	1 (3.6)	
More than 12 days	2 (5.0)	7 (17.1)	12 (29.3)	9 (32.1)	
Any comorbidity among home-isolated patients					
Diabetes	0 (0.0)	2 (4.9)	6 (14.6)	9 (32.1)	0.000**
Heart disease	0 (0.0)	0 (0.0)	4 (9.8)	6 (21.4)	
Hypertension	0 (0.0)	1 (2.4)	8 (19.5)	8 (28.6)	
No comorbidity	40 (100.0)	38 (92.7)	23 (56.1)	5 (17.9)	
COVID-19 Symptoms					
Cough, breathing difficulty	9 (22.5)	5 (12.2)	20 (48.8)	10 (35.7)	
Fever, body ache	18 (45.0)	22 (53.7)	13 (31.7)	14 (50.0)	

None	9 (22.5)	9 (22.0)	6 (14.6)	3 (10.7)	0.023*
Stress	4 (10.0)	5 (12.2)	2 (4.9)	1 (3.6)	
Total	40	41	41	28	

Percentage indicated in parenthesis

P value obtained by using chi-square and fisher's exact test

*Statistically significant at 5%, **statistically significant at 1%

Age was a significant variable that was correlated with all three scales, with older participants having a longer isolation time, more comorbidity, and more symptoms. As shown in Figure 1, the results showed that covid-19 isolation periods of less than 5 days, 5-12 days, and more than 12 days were significantly increased with age. When comparing age with comorbidities among home-bound patients, it was discovered that participants in the 45-60 and > 60 age groups were directly associated with an increased risk of more comorbidities such as diabetes, heart disease, and hypertension (shown in figure 2). The COVID-19 symptoms included in this analysis are depicted in Figure 3. It was discovered that symptoms increased significantly with age.

Figure 1
Association of Age with COVID-19 Isolation Period

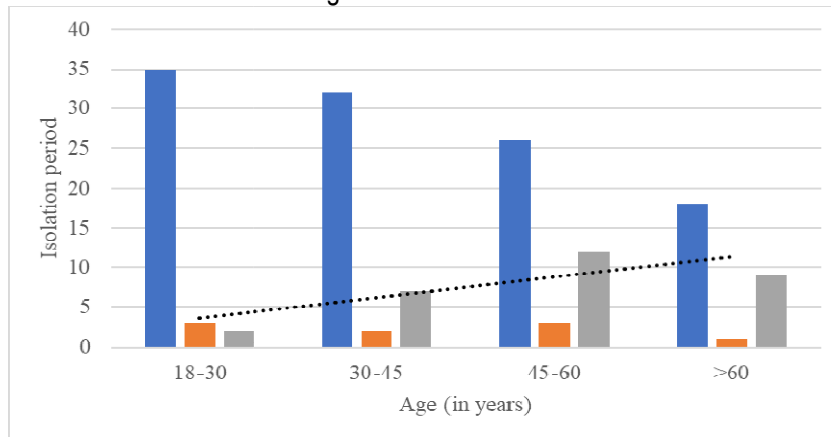


Figure 2
Relation of Comorbidities with Age of Home-isolated COVID-19 Patients

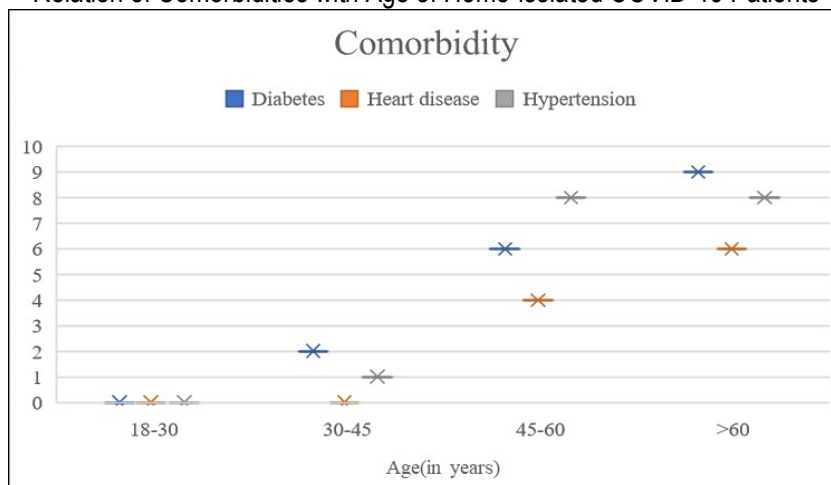
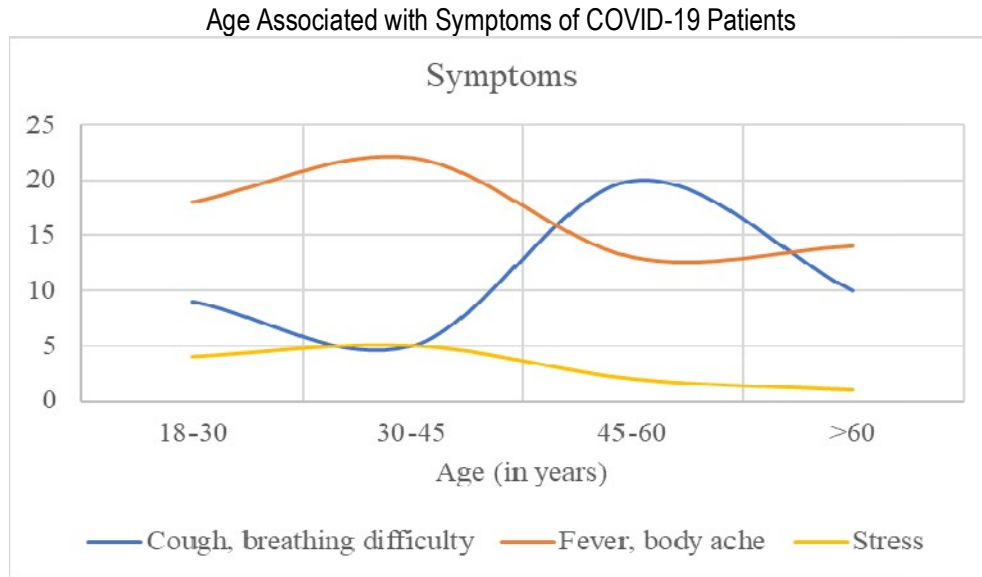


Figure 3



Knowledge regarding Self-care Nutrition

Table 4 depicts the distribution of patient responses to each knowledge question, with gender differences. There was no statistically significant difference between gender distribution and knowledge question items. A higher proportion of females (69.64%) and males (64.89%) were unaware of the existence of specific nutrient-rich foods. In contrast, 17 (30.35%) female and 33 (35.10%) male participants were aware of the importance of including protein, vitamin, and carbohydrate-rich foods in their diet. The majority of female (89.28%) and male (84.04%) patients were knowledgeable about incorporating various types of healthy fluids such as coconut water, fruit juice, ORS, herbal remedies (i.e. honey and ginger water, *kadha*) and replacing their normal water with hot water. More than half of females and males (60.71% and 69.15%, respectively) believed that there are no special foods to eat that reduce the incidence of coronavirus. Home remedies such as *ajwain*, *amla*, *giloye*, and *lemon water* were effective throughout home isolation, according to half of the females and 56.38 percent of males. According to 72 males and 39 females, eating more citrus fruits was ineffective for completing nutrition during home isolation.

Table 4
Knowledge regarding Self-care Nutrition (N=150)

Variables	Females	Males	Total	χ^2	p-value
Incorporation of specific nutrient-based food					
No	39 (69.6)	61 (64.9)	100 (66.7)	0.356	0.551
Yes	17 (30.4)	33 (35.1)	50 (33.3)		
Carbohydrate-rich food	1 (5.9)	1 (3.0)	2 (4.0)		
Protein-rich food	9 (52.9)	17 (51.5)	26 (52.0)		
Vitamin and mineral-rich	7 (41.2)	15 (45.5)	22 (44.0)		
Introduce different type of fluids					
No	6 (10.7)	15 (16.0)	21 (14.0)	0.801	0.371
Yes	50 (89.3)	79 (84.0)	129 (86.0)		
Coconut water	16 (32.0)	29 (36.7)	45 (34.9)		
Fruit juice	12 (24.0)	19 (24.1)	31 (24.0)		
Herbal remedies, hot water	7 (14.0)	13 (16.5)	20 (15.5)		
Hot water	9 (18.0)	6 (7.6)	15 (11.6)		
ORS	6 (12.0)	12 (15.2)	18 (14.0)		
Special food to eat for minimizing the impact of COVID-19					

No	34 (60.7)	65 (69.2)	99 (66.0)	1.112	0.292
Yes	22 (39.3)	29 (30.9)	51 (34.0)		
<i>Almonds & turmeric milk</i>	1 (4.5)	1 (3.4)	2 (3.9)		
<i>Daliya</i>	2 (9.1)	0 (0.0)	2 (3.9)		
<i>Fruits</i>	19 (86.9)	28 (96.6)	47 (92.2)		
Usage of home remedies in isolation					
No	28 (50.0)	41 (43.6)	69 (46.0)	0.575	0.448
Yes	28 (50.0)	53 (56.4)	81 (54.0)		
<i>Ajwain remedies</i>	1 (3.6)	5 (9.4)	6 (7.4)		
<i>Amla</i>	6 (21.4)	10 (18.9)	16 (19.8)		
<i>Giloye</i>	8 (28.6)	20 (37.7)	28 (34.6)		
<i>Lemon with hot water</i>	13 (46.4)	18 (34.0)	31 (38.3)		
Eating more citrus fruits					
No	39 (69.6)	72 (76.6)	111 (74.0)	0.881	0.348
Yes	17 (30.4)	22 (23.4)	39 (26.0)		
<i>More than two times a day</i>	2 (11.8)	2 (9.1)	4 (10.3)		
<i>Once a day</i>	9 (52.9)	13 (59.1)	22 (56.4)		
<i>Twice a day</i>	6 (35.3)	7 (31.8)	13 (33.3)		

Percentage indicated in parenthesis

P value obtained by using chi-square and fisher's exact test

*Statistically significant at 5%, **statistically significant at 1%

Attitude towards Self-care Nutrition

Table 5 depicts the patient response distribution for each question concentrating on attitude toward self-care nutrition. Males responded to the attitude section item "Taking nutrition advice from medical staff" with a significantly higher rate of "Yes" (78.72% vs 64.29% females, $p=0.05$). The vast majority of respondents (98.21% females and 95.74% males) did not wish to alter their eating habits. Women (73.21%) had a significantly ($p=0.004$) higher proportion of knowledge about emotional changes than men (48.93%). The majority of females (33.9%) and males (42.6%) were satisfied with their dietary intake. Furthermore, males (69.6 percent) were less significant than females (83.0 percent) to modify their taste preferences attitude, such as changing their diets, more or less salty, sweet, and spiced food, and so on.

Table 5
Attitude towards Self-care Nutrition (N=150)

Variables	Females	Males	Total	χ^2	p-value
Nutrition advice from medical staff					
No	20 (35.7)	20 (21.3)	40 (26.7)	3.740	0.053*
Yes	36 (64.3)	74 (78.7)	110 (73.3)		
Prefer to change food habits during the isolation period					
No	55 (98.2)	90 (95.7)	145 (96.7)		0.651
<i>Non- vegetarian</i>	8 (14.5)	22 (24.4)	30 (20.7)		
<i>Ova- vegetarian</i>	0 (0.0)	1 (1.1)	1 (0.7)		
<i>Vegetarian</i>	47 (85.5)	67 (74.4)	114 (78.6)		
Yes	1 (1.8)	4 (4.3)	5 (3.3)		
<i>Non- vegetarian</i>	0 (0.0)	1 (25.0)	1 (20.0)		
<i>Ova- vegetarian</i>	1 (100.0)	3 (75.0)	4 (80.0)		
<i>Vegetarian</i>	0 (0.0)	0 (0.0)	0 (0.0)		
Changes in emotional well-being					
No	15 (26.8)	48 (51.1)	63 (42.0)	8.491	0.004**
Yes	41 (73.2)	46 (48.9)	87 (58.0)		
<i>Depression</i>	16 (39.0)	17 (37.0)	33 (37.9)		

<i>Difficulty in concentration</i>	4 (9.8)	7 (15.2)	11 (12.6)		
<i>Insomnia</i>	12 (29.3)	19 (41.3)	31 (35.6)		
<i>Mood swings</i>	9 (22.0)	3 (6.5)	12 (13.8)		
Feel satisfied with dietary intake					
Dissatisfied	11 (19.6)	13 (13.8)	24 (16.0)		0.173
Neither satisfied nor dissatisfied	10 (17.9)	14 (14.9)	24 (16.0)		
Not satisfied	16 (28.6)	24 (25.5)	40 (26.7)		
Satisfied	19 (33.9)	40 (42.6)	59 (39.3)		
Very much satisfied	0 (0)	3 (3.2)	3 (2.0)		
Changes in food taste preferences					
No	39 (69.6)	78 (83.0)	117 (78.0)	3.637	0.045*
Yes	17 (30.4)	16 (17.0)	33 (22.0)		
<i>low-salt food</i>	3 (17.6)	3 (18.8)	6 (18.2)		
<i>more salty food</i>	6 (35.3)	7 (43.8)	13 (39.4)		
<i>more spicy food</i>	0 (0.0)	2 (12.5)	2 (6.1)		
<i>more sweet food</i>	3 (17.6)	0 (0.0)	3 (9.1)		
<i>Bland diet</i>	5 (29.4)	4 (25.0)	9 (27.3)		

Percentage indicated in parenthesis

P value obtained by using chi-square and fisher's exact test

*Statistically significant at 5%, **statistically significant at 1%

Practice Self-care Nutrition

Table 6 shows the distribution of participant responses to each question about self-care nutrition practiced during home isolation. Males responded significantly more positively to the item of practice section "Changes in eating routine during isolation period" as well as "Disturbance in daily routine" (53.19% vs 35.71% in females, $p= 0.038$). Females (57.14%) had a higher proportion of more frequent practices regarding changes in water intake than males (52.12). Similarly, female (80.35%) participants experienced fatigue, weakness, restlessness, and sleepiness more frequently than males (72.34%).

Table 6
Practice Self-care Nutrition (N=150)

Variables	Female	Male	Total	χ^2	p-value
Changes in eating routine during the isolation period					
No	20 (35.7)	50 (53.2)	70 (46.7)	4.306	0.038*
Yes	36 (64.3)	44 (46.8)	80 (53.3)		
<i>Irregular eating</i>	1 (2.8)	2 (4.5)	3 (3.8)		
<i>Overeating</i>	3 (8.3)	2 (4.5)	5 (6.3)		
<i>Under eating</i>	32 (88.9)	40 (90.9)	72 (90.0)		
Disturbance in daily routine					
No	20 (35.7)	50 (53.2)	70 (46.7)	4.306	0.038*
Yes	36 (64.3)	44 (46.8)	80 (53.3)		
<i>Change in sleeping pattern</i>	3 (8.3)	3 (6.8)	6 (7.5)		
<i>Loss of appetite</i>	32 (88.9)	40 (90.9)	72 (90.0)		
<i>Medication schedule</i>	1 (2.8)	1 (2.3)	2 (2.5)		
Change in routine water intake					
No	24 (42.9)	45 (47.9)	69 (46.0)	0.355	0.551
Yes	32 (57.1)	49 (52.1)	81 (54.0)		
<i>Increased water intake</i>	29 (90.6)	47 (95.9)	76 (93.8)		
<i>decreased water intake</i>	3 (9.4)	2 (4.1)	5 (6.2)		
Changes in your energy level during this period					

No	11 (19.6)	26 (27.7)	37 (24.7)	1.213	0.271
Yes	45 (80.4)	68 (72.3)	113 (75.3)		
<i>Fatigue/low energy</i>	24 (53.3)	42 (61.8)	66 (58.4)		
<i>Feeling of weakness</i>	11 (24.4)	16 (23.5)	27 (23.9)		
<i>Restlessness</i>	1 (2.2)	4 (5.9)	5 (4.4)		
<i>Sleepiness</i>	9 (20.0)	6 (8.8)	15 (13.3)		

Percentage indicated in parenthesis

P value obtained by using chi-square and fisher's exact test

*Statistically significant at 5%, **statistically significant at 1%

Discussion

This online cross-sectional survey was conducted among home-isolated COVID-19 patients in rural northern India to assess their knowledge, attitudes, and practices regarding self-care nutrition. This study discovered many significant gender-related factors influencing nutrition knowledge, attitude, and practice, which could be favorable in developing nutrition education programs for epidemic diseases.

The majority of respondents in this study were married and aged 18 to 45 years, indicating that young and reproductive-age participants were more infected with COVID-19 and 74 per cent recovered after a 5-12 days home isolation period. Fever and body ache was the most frequently identified symptoms in 67 participants (44.7%). According to the study's findings the home isolation period, symptoms, and comorbidities increased significantly with age (in years). This study also looked at the attitudes of KAPs toward home-isolated covid-19 patients and discovered that some self-care nutrition factors differed significantly between male and female participants.

The findings of the current study on the conception towards COVID-19 pandemic are similar to the results of the study conducted by Murarkar *et al*². Fever was the most common presenting symptom being present in 168 (49.4%) cases, followed by cough and generalized weakness in 160 (47.1%) and 61 (17.9%) patients, respectively. The cold was encountered in 45 (13.2%) patients. Hypertension alone was present in 64 (10%) of the patients and 43(6.7%) had diabetes. Age is correlated to a decrease in the number of quarantine days; participants under the age of 18 who are healthy and have minor symptoms are more likely to experience a shorter quarantine period³. In the present study, it is observed that 87.5 per cent of the participants between the ages of 18 and 30 finished their home isolation phase in just 5 to 12 days. In an earlier study⁴ of COVID-19 patients aged 18 to 33, it is noted that symptoms began on day 5 and peaked on day 12.

Furthermore, compared with the findings of other studies^{5,6} the most common symptoms among COVID-19 patients aged 49 to 70 were fever (81.9 %), cough (63.2 %), muscle aches (7.7 %), and diarrhoea (12.9%). Patients over the age of 62 were more likely to experience hypertension (36.5%) and diabetes (15.5%) as sequelae, with cerebrovascular disorders (6.7%) and cardiovascular diseases coming in second and third, respectively (6.1%). (Huang *et al* 2020). According to an earlier study by Abarca, *et al*⁶. on 1,280,806 Mexican patients, diabetes mellitus (DM) is one of the most common comorbidities in patients with COVID-19 aged up to 60 and 65 years old, and 21.8 per cent of diabetic patients had a higher prevalence of COVID-19 and an additional 12.2 per cent higher prevalence of COVID-19 pneumonia. Significant direct connections with COVID-19 positive were seen in the elder group for fever, bodily discomfort, cough, and taste or smell problems, according to a narrative review by Treyisan *et al*⁷. in 2021. Reporting no symptoms was linked to an 86 percent lower chance of getting a positive COVID among younger participants.

The findings on knowledge, attitude, and practices (KAPs) regarding self-nutrition care among home-isolated COVID-19 patients are similar to the results of other studies. In comparison to the same period

in 2019, Spanish citizens consumed less alcohol, slightly more eggs and red meat, and much more plant-based foods like almonds, pasta, rice, and processed vegetables. Despite these adjustments, red meat intake remained greater than advised, while plant-based food products continued to fall below the suggested level. However, Chinese food habits also shifted during the COVID-19 lockdown, with a decline in the consumption of poultry, beef, and soybean products. More than half of the study participants increased their fruit consumption, particularly their consumption of citrus fruits, according to the findings of the study on nutrition-related behaviours.

According to Nuertey *et al.*⁸ research on the practice of home remedies used by participants who tested positive for COVID-19, drinks and herbal mixes were consumed to improve the body's natural defence mechanism. They also demonstrate their knowledge of natural cures by describing ginger as "hot," either on its own or in conjunction with other fruits, herbs, or seeds that have the ability to burn the virus and stop the illness from causing harm to the body. They also thought that lemon, which has acidic qualities and is a common element in many beverages used to treat COVID-19, works to inhibit it. Because it's commonly believed that viruses flourish in cold environments and are killed by heat, some people started consuming certain teas and drinking hot water in an effort to avoid COVID-19. Over 25 per cent of all home remedies use lemon, which may be prepared in a variety of ways, including lemon juice alone, lemon juice combined with honey and ginger, lemon juice combined with other fruits, and lemon juice in warm water with or without sugar or honey.

Similar results were found by Tripathy *et al.*⁹ regarding participant awareness and practice of taking turmeric as an immune booster during COVID-19 and their perception of curcumin as a natural and risk-free bioactive component of turmeric. Triglycerides, which are found in fat, increase the solubility and bioavailability of curcumin, making milk and milk products among of the greatest media for curcumin. According to a research by Ngwewondo *et al.*¹⁰ on Knowledge Attitude and Practice (KAPs) concerning COVID-19, 74.6 per cent of the participants consumed citrus fruits like lemons and also used vitamin C supplements. An experiment by by Murugesan *et al.*¹¹ on ayurvedic medicinal herbs to cure coronavirus-infected patients, it was found that he utilized amla and giloy extract. It has been proved that taking amla orally or as a powder boosts the body's ability to control both primary and secondary antibody levels and the immune system.

The majority of individuals (79%) altered their eating habits while confined at home for COVID-19. Water, tea, coffee, fruit, whole grains, vegetables, and beverages all saw a rise in consumption. Fish, shrimp, crab, chicken meat, and other non-vegetarian foods were consumed less frequently¹². The study findings by Renzo *et al.*¹³ revealed that individuals' life were significantly impacted by COVID-19 and self-isolation, especially on their eating and sleeping habits. Stress makes individuals overeat, especially comfort foods rich in simple carbs, which are proportionate to the glycemic index of meals and are linked to a higher risk of obesity and cardiovascular disease as well as more severe COVID-19 consequences. During the COVID-19 lockdown, more than half of the populace reported changing feelings of satiety and hunger: 17.8 per cent of the respondents said they had less of an appetite, while 34.4 percent said they had more of an appetite. Throughout COVID-19, there was an increase in the consumption of fruit, vegetables, nuts and legumes. Participants' water consumption ranges from less than one litre (26.6%) to more than two litres (60.4%) and more than two litres (2.6%).

Conclusion

In the age groups of 45 years and above, individuals with comorbidities were much more likely to have symptoms and other health issues related to COVID-19 than younger patients. It is necessary to increase participant knowledge in order to correctly include nutrient-dense meals. As a result of this study, nutrition educators and healthcare professionals may receive some advice on how to encourage

the public to adopt healthy eating habits as well as on how to improve psychological health and implement healthy changes in daily routine for a healthier lifestyle in the event of pandemics in the future.

Limitations

This study does have some drawbacks. First off, there are fewer participants. If we use data from people in different regions, we may have a better understanding of the epidemic and improve our KAPs scores. Second, those without access to the internet or a google account may go unnoticed if a web-based questionnaire is used. Third, the study skips over the KAPs score and the relationship between knowledge and the practice and attitude factors. These restrictions all provide opportunities for an additional, interesting study. It is anticipated that the strong evidence presented in this study will be significant for health care professionals and the community to act on the biggest infectious and unprecedented health concerns in the community.

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