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A Situational Review of Recommended Dietary and Lifestyle Management Guidelines during the COVID-19 Pandemic

*Shruti Verma and **Allen P Ugargol

*Researcher, Mail : vdrshruti@gmail.com
**Associate Professor of Practice, Centre for Public Policy (CPP), Indian Institute of Management Bangalore (IIM-B), Bannerghatta Road, Bengaluru – 560076; E-mail: allen.ugargol@iimb.ac.in

Abstract

Good nutritional support is critical for the immune system to be prepared to deal with the coronavirus (COVID 19) infection. However, in the context of the ongoing pandemic, there is a glut of nutritional information, sometimes unauthenticated, that makes understanding and adherence to nutritional guidelines impractical. This short situational review is an attempt to review, synthesize and summarize nutritional guidelines provided by national and international agencies to support optimal dietary/nutrient intake during this pandemic scenario. Nearly all authenticated guidelines and supporting literature recommend a daily intake of Vitamin A, B, C, D, E, and minerals such as Se, Fe Cu, Zn, phytonutrients, amino acids and omega 3 fatty acids since these are the vital micronutrients that optimize immune functions. In addition to these, dietary supplementation with Zinc, Selenium and Vitamin C are also recommended as a preventive measure since they possess natural infection fighting ability, though evidence against coronavirus infection is lacking. Though Covid-19 is not a food borne disease, it is pertinent that guidance related to maintaining good personal hygiene, hand hygiene and precautions related to food handling can help in keeping virus transmission at bay.

Keywords: Covid-19, Pandemic, Authenticated Guidelines, Nutrition, Micronutrients, Immunity, Dietary supplements, Hygiene.

Introduction

While physical distancing and regular handwashing are the most effective and proven methods to reduce the risk and spread of the coronavirus disease (COVID-19), this article serves to helpunderstand more about the link between nutrition and immunity, and reviews existing evidence on the role of nutritional status and supplementation in enabling the body to overcome the infection during the pandemic.The Covid-19 pandemic situation which began in India aroundJanuary 2020 has severely affected lifestyles,healthcare systems, and national and global economies substantially[1].Good nutritional status is one of the main determinantsof health that can improve overall well-being and mitigate the harmful health consequences related with physical distancing and indoor confinement. Appropriate nutrition is known to prevent or control most chronic diseases such as diabetes, hypertension, and excess body weight/obesity; and aid in the regulation of requisite sleep and mood; and prevent fatigue[2,3]. Whenever the body experiences an infection it tends to produce fever which takes a toll on the body because the body needs extra energy and nutrients during recovery. Therefore, maintaining a healthy diet and lifestyle should be the topnotch preference for every human being during these pandemic times. While no foods or dietary supplements or natural health products can prevent COVID-19 infection, maintaining a healthy diet along with other healthy behaviors are an important part of supporting a strong immune system[4]. A good nutritional status is hence very important to maintain a strong immune system that can be prepared to fight the virus.

In the contemporary time of this global pandemic there is increased awareness around the significance of healthy foods to sustain a healthy lifestyle in order to keep infections at bay. As far as diet is concerned it should include dietary variety and diversity. Diets vary greatly from place to place based on many factors including eating habits, staple diets, seasonality and culture. The optimization of nutrient intake through well-balanced meals and the use of good hygiene practices in food selection, preparation, and conservation is one of the most effective approaches for managing the continuous risk of viral infection[1]. Dissemination of useful dietary and lifestyle guidelines for healthcare professionals and to the general public thus becomes a critical strategy.It is very likely that the general public could become overloaded with massiverange of nutritional guidelines which is being provided by government authorities,nutritional enthusiasts and healthcare professionals, since these recommendations are sometimes conflicting or non-evidence based. We should be very careful regarding what advises should be given to general public. Hence, through secondary data review this review article summarizes national and international nutritional and lifestyle management guidelines during COVID-19 and sheds lighton general dietary and lifestyle guidelines that the general public can follow during the pandemic. We have reviewed theguidelines/recommendations as provided by Food safety and standards authority of India (FSSAI), Food and Agricultural Organizations (FAO), Institute of Medicine, Brazilian Association of Clinical Nutrition, US Department of Health and Human Services andIndian Dietetic Association during this period.

Recommended Dietary and Lifestyle Regimen

1)   Follow a healthy diet and make the right choices from among the foods that are available.Choose to consume local foods,try as much to stick to staple diets, whole grains, fresh and seasonal fruits and vegetables. Ensure that you eat a variety of foods.

2)   Diets rich in fruits and vegetables contain beneficially high amounts of vitamins and minerals such as vitamins A, C, D, E, and B complex, as well as zinc and selenium, which are important modulators of the immune system[4]. These should be included in your diet on a daily basis. In addition to this, increased consumption of fruits and vegetables is encouraged to improve antioxidant levels in the body[5]and they are good source of water and fiber as well-all of which play a pivotal role in controlling and limiting other comorbidities if present[6].

3)   Micronutrients are responsible for maintaining proper immune function through a variety of pathways in both innate and adaptive immune responses[1]. Various vitamins such as A, C, D, E, B6, and B_{12} and zinc are important for the maintenance of structural and functional integrity of physical barriers as well as for the differentiation, proliferation, function, and migration of innate immune cells[7]. Hence, ensuring an adequate intake of micronutrients during recovery phase of COVID 19 as well as during normal scenario is essential.

4)   Choose traditional recipes and methods of preparation involving staple diets that support your immunity needs.

5)   Nearly all multilateral, international and national organizations recommend avoiding the intake of salt, fat, and sugar and encourage reduction in sugary drinks, other sugar-rich products, meat portions, and other foods of animal origin to lower the intake of saturated fat[8-10].Therefore, avoid *vanaspati*, shortenings and margarine and limit consumption of highly processed foods [biscuits, cheese, pies, cakes, breakfast cereals etc.], fried foods, sweetened foods, carbonated drinks, snacks etc. as these are high in sugar/salt and poor in desirable nutrient contents.

6) While some organizations recommend choosing unprocessed foods,[9,11] we can rely on healthy dried, frozen, or canned foods (e.g., fish, fruits, soups) as suggested alternatives when fresh produce is not available[11].

7) Try to get exposure to sunlight for at least 15 min per day (preferably between 11am and 1pm if feasible, while taking the necessary precautions) as this will ensure adequate vitamin D availability while adhering to precautions in the time of Covid-19.

8) Keep your body active and regularly check your weight. Moderate physical activity/yoga will reduce stress and help build immunity.

9) Keep your body hydrated with adequate water intake is known to provide health and recovery from any infection. However, no guidance on water requirements (e.g., cups or milliliters per day) was explicitly available in the reviewed guidelines[4,12.]. Water is essential for maintaining cellular homeostasis, body temperature, mood regulation and for maintaining other important physiological parameters. Since, the daily water requirement is influenced by age, sex, level of physical activity, diet, body composition, pregnancy, environmental conditions, and the presence of disease, the recommended intake of water varies widely and can be as high as 3.7 L/day for older adults (including all water contained in food, beverages and drinking water)[13]. In general, the recommended intake of water for adults is 8-10 glasses[4].

10) Inclusion of a probiotic in the diet is also known to be beneficial as probiotics are defined as live microorganisms and when administered in adequate amounts, confer a health benefit on the host[14]. They tend to act through diverse mechanisms, including modulation of immune function, production of antimicrobial compounds and organic acids, improvement of gut barrier integrity, formation of enzymes, and interactions with the resident microbiota[15]. Studies on probiotic species belonging to the Lactobacillus and Bifidobacterium genera have shown promising results regarding their role in improving immune function[16]. Daily intake of pre and probiotics in the form of fermented foods or fermented dairy products are advisable during the recovery phase of COVID 19 in order to maintain the gut health/microbiota back.

11) Smoking and alcohol are known to adversely impact the immunity and increase the risk of severe infections, hence substance abuse of any kind must be generally avoided. Stay connected with family and friends and engage in healthy activities and avoid binging on food or drink.

12) Over the last 3 decades, we have seen that literature has consistently showed a positive relationship between mono and poly unsaturated fatty acids and their favorable immune modulatory response[17]. For adult males and non-pregnant/ non-lactating adult females, the recommended dosage of omega-3 polyunsaturated fatty acids (eicosapentaenoic acid plus docosahexaenoic acid) is 250 mg/d[18], although should be taken as prescribed or suggested by physician.

Dietary Supplementation

A. However, micronutrients help in improving immunity; though sometimes it has been seen that mega doses of vitamins and minerals can aggravate adverse effects [19-20] or sometimes interact with other ongoing medications, leading to enhanced or reduced pharmacological effects[21]. Hence, avoid self-medicating with vitamins and minerals and seek the advice of a medical professional.

B. The Brazilian association of Clinical Nutrition[22] have reported that vitamin supplementation may be useful for individuals at risk of viral respiratory infections. Vitamin C is a recognized antioxidant

nutrient that can enhance chemotaxis, phagocytosis, generation of reactive oxygen species, and, ultimately, microbial killing[23]. It can reduce the duration of cold by 8to 18 per cent. Doses of any supplement should be taken as advised by the doctor.

C. Zinc and selenium are antioxidant micronutrients often considered for supplementation[23]. Zinc is a cofactor of superoxide dismutase, an enzyme presents in the mitochondria and cytosol of cells that suppresses oxidative stress[1]. In addition, zinc is critical in generating both innate and acquired (humoral) antiviral responses. Zinc supplementation (i.e., elemental zinc, 30 mg/d) might be adequate to improve immune function and to reduce the risk of infections in this group[24]. Selenium is an important trace element that can be found in nuts, breads, grains, meat, poultry, fish, and eggs and is easily obtainable from dietary sources.

Role of Specific Nutrients and Foods to Maintain Optimal Immune Function and Good Health

Essential micronutrients such as vitamin A, B, C, D, E, and minerals such as Se, Fe Cu, Zn, phytonutrients, amino acids and omega 3 fatty acids are the most important nutritional entities for optimizing immune functions. For example, vitamin A helps in maintenance of mucosal epithelial cells of the respiratory tract and enhance mucosal immunity. A healthy gut helps to reinforce the immune system and increases immune response and promotes specific immune signaling. This may be aided by including foods rich inpre- and probiotics regularly. All these nutrients can be obtained from a well-balanced diet, although one should understand the fact that sometimes deficiency of one or more nutrients may worsen the severity of infection in adult population; therefore, balanced diet is the key achieve optimal health and nutrition during these pandemic times.

Literatures[1] have suggested that we must avoid megadose supplements (higher than the recommended dietary allowance or RDA) as they can generally be harmful. Supplements that promote unverified health claims should be avoided just as fraudulent products claiming to prevent, diagnose, treat, or cure COVID-19. It is important that one must never consider nutritional supplements as substitutes for a good diet since no supplements can substitute for the benefits provided by the intake of fresh and healthy foods.

Food and Personal Hygiene

COVID-19 is a respiratory virus and is not a food-borne disease; however, all the reviewed literature has emphasized the importance of adequate personal hygiene while handling the food and highlighting the necessity of handwashing with soap and water or alcohol-based hand sanitizers. Till date there is no supporting literature is available that highlights that the disease can be spread through contact with the food purchased. However, The Food and Agriculture Organization of the United Nations[4]advise to practicing the five keys to food safety: (1) keep clean; (2) separate raw and cooked; (3) cook thoroughly; (4) keep food at safe temperatures; and (5) use safe water and raw materials. On the other side the in-depth guidelines of FSSAI[5] has suggested segregated guidancerelated to purchasing of food items, ordering food from delivery platform and precautions that should be taken while handling food. Few general recommendations related to points suggested by FSSAI regarding purchasing, ordering and handling of foods are as follows: (1) go out for grocery shopping only when it is necessary, (2) wear mask, (3) carry a 70% alcohol-based sanitizer, (4) own basket/bag for keeping grocery, (5) shop during non-peak hours and use of e-wallets, (6) keep all the shopped items separately and (7) used mask and gloves should be disposed immediately in a bin, (8)use contact less delivery modes where food packets are left outside your door and customer is informed on call, (9) in case contact less delivery is not possible then maintain at least 1 meter distance, (10) opt for cash less mode of payment UPI, QR codes, Net banking, E-wallets, (11) wash hands for 40-60 seconds with water and soap before

handling/preparing/consuming/finishing foods and after using masks or gloves,(12) clean and disinfect food preparation surface/sink/utensils with hot soapy water, along with high standards of personal hygiene should be maintained during food preparation.

How to Improve Adherence to Nutritional Advisories among the General Public

It is the objective of all organizations working for public health and nutrition to instill behaviors that improve nutritional intake and encourage healthy eating habits in the community. By creating more public awareness regarding nutritional guidelines (specific to immunity boosters and inflammation fighting) among the community through various marketing campaigns that include print media, social media and door to door, larger public health gains can be achieved. It is the time to innovate in reaching out to remote and rural populations owing to the spread of the pandemic to rural parts of India too. It is imminent to have and sustain the partnerships with stakeholders such as the private sector, non-governmental organizations, academic and research bodies, pharmaceutical and nutraceutical manufacturers who can be sought to produce dietary supplements at subsidized rates for the public delivery systems such that the outreach along with the provision of fresh fruits, vegetables and perishable food items such as milk or eggs is able to overcome the shortage or deficiency for those who are unable to procure the same.

Conclusion

This situational review summarizes current scientific literature andrecommendations from national and international nutrition agencies on healthy diet and lifestyle management that one could adopt during these pandemic times. The attempt of this synthesis of all national and international guidelines regarding diet is suggestive to include more dietary diversity and variety in the diet on a daily basis which should be well balanced in terms of energy, protein and micronutrients[if necessary, include dietary supplements (Zn, Se, Omega 3 fatty acids, Vitamin C) too],so that our body have all the essential nutrients which helps in increasing our immunity and to fight sufficiently with any viral infection and keeping the inflammation at bay. If we are keen to improve adherence to nutritional guidelines for effective Covid-19 management then the larger civil society should seek governmental support in enabling these nutritional initiatives for the community. While awareness generation can only help those who have the basic access to food and have the purchasing power to obtain the commodities; however, it will still leave out substantial proportion of the population who might have the knowledge but lack of the basic access to food to maintain good health and nutritional status during this crucial pandemic period.

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Association of Covariates with Neonatal, Infant and Under-5 Mortality in India: A Special Reference to Maternal Height

*A.K. Tiwari and **Anuj Singh

*Professor, Department of Statistics, Institute of Science, Banaras Hindu University, Varanasi-221005
**Ph.D. Scholar, DST-CIMS, Institute of Science, Banaras Hindu University, Varanasi-221005; E-mail: anuj@bhu.ac.in

Abstract

Global and regional evidence showed that mother, child and household covariates as strong predictors of child-mortality. However, there is limited information that confirms the anthropometric effect on the high risk of child-mortality in India. Therefore, this study examines the association of covariates along with maternal height with neonatal, infant and under-5 mortalities in India. Descriptive statistics and Modified Poisson Regression have been used to examine the association of mother, child and household covariates with child-mortality in India using National Family Health Survey (NFHS-4), 2015-16 data (DHS of India) for the study. Based on our analysis, we found that mother's, child and household covariates plays significant role in neonatal, infant and under-five mortality in India. After considering maternal-height, model given better results for child-mortality.

Keywords: Child-Mortality, Maternal Height, Maternal Age at birth, Maternal-education, Birth-order.

Introduction

Since mortality-rates across different age-groups have continued to decline in last five decades but the numbers of child and adolescent deaths remain unconscionable – 7.4 million children and young people died under the age of 25 years in 2019. More than 5 million children died before reaching their age five, and nearly half of those deaths were among neonatal death[1]. Recently, progress has been noticed in each year but it is urgent to accelerate our efforts in preventing child deaths. Current trends predict that 48 million children under five years will die between 2020 and 2030.The world has started working toward a new global development agenda with seventeen goals (called Sustainable Development Goal SDG). The one major target of SDG is to reduce the child mortality rate to at least as low as 25 deaths per 1000 live births and neonatal mortality to at least as low as 12 deaths per 1000 per lives births by 2030. The Progress has also been uneven, and children continue to face grave disparities in their chances of survival. In sub-Saharan Africa, for example, 1 in 13 children died before reaching their fifth birthday– a rate that is 20 times higher than the rate of 1 in 264 in the region of Australia and New Zealand and 20 years behind the world average, which achieved a 1 in 13 rate by 1999[2] and low-middle income countries like India the condition of child-mortality is still not very good like developed countries.

The factors related to child survival were sensitive indicators and played important role for socio-economic development and it also showedgeneral health condition of any nation. Among the various factors affecting child mortality and child survival during the early infancy, the following factors, viz, mother's age at birth, their education, birth-order, and illegitimacy, were frequently referred. There were many studies showed that socio-economic determinant plays important role in child-mortality[3]. According to British perinatal mortality survey of 1958[4], the risk of pregnancy loss showed an increasing trend with the increase in age of mother after age thirty and Countries where girls were more risk to die than boys, reporting on child mortality separately by sex[5]. In low-middle income countries (LMICs), short maternal stature was associated with about 6.5 million term or preterm, small-for-gestational age

(SGA) births, caused by foetal growth retardation(FGR) annually[6]. Recently, few studieshave shown thatmaternal height as a strong predictor of under-five mortality in LMICsby using pooled data analysis[7,8] i.e. first studies showed that reductions in maternal height from the average of 155cm gradually increased the risk of under-five mortality. Second study showed that children of mothers with short stature (<145 cm) had about 1.6 times higher risk of neonatal mortality and nearly 1.4 times higher risk of under-five mortality compared with those with taller mothers (≥160 cm).

Some literatures have shownthe associations between maternal height and mortality[9]. The studies conducted in urban Bangladesh and for India have been investigatedthe association between maternal height and preterm birth and low birth weight[10-13]. Another study India indicated that survival of children in India is low among shorter females as compare to tall females[14].Therefore, this study was conducted to see the impact of covariates related to child-mortality in India using a nationally representative sample.

Objective

In the contrast of the above background, the study is conducted to examine the prevalence and relative-risk of neonatal mortality, infant mortality and under-5 mortalitieswith mother,child and household covariates in India.

Methodology

The study is based on the data available from the National Family Health Survey (NFHS) 2015-16.The fourth round of the NFHS, provides information on population, health and nutrition for both men and women at national, state and district level for India.NFHS-4, for the first time, providesinformation on many important indicators and given special emphasis on maternal and child health outcomes. NFHS-4 collects information from 601,509 households, 699,686 women, and 112,122 men of children aged 0-59 months, women aged 15-49 years and men aged 15-54 years.All selected womenhave been surveyed by the NFHS-4, were asked to provide a complete birth history, including sex, date of birth, and survival status for each live birth and their anthropometric measures especially height of women. For children who had died, age at death was also collected, recorded in days for children dying in the first month of life, in months for children dying after the first month but before their second birthday, and in years for children dying at later ages.

Modified Poisson Regression (i.e., Poisson regression with a robust error variance) has been used to identify directly the relative-risk of neonatal, infant and under-five mortality with mother's covariates (maternal height, maternal age at birth, and mother's educational level), child covariates (birth-order and sex of the child) and household covariates (caste, religion, wealth-index and place of residence) of India.We estimated models that took account of the sample weights and the multistage cluster survey sampling design of the National Family Health Survey, 2015-2016. Statistical precision was ascertained using 2-tailed Wald tests and results are presented with 95 per cent CIs.

Firstly, Poisson Regression is regression model which assumes that the dependent variable follows Poisson distribution. This model is used for the random variable having a value of 0, 1, 2... n. For a random variable Y (neonatal mortality, infant mortality and under-5-year mortality in India) which follows Poisson distribution with parameter λ, the probability of y events (number of child deaths in India) in unit time is-

$$P(Y=y) = \frac{e^{-\lambda}\lambda^{y}}{y!}; y=0, 1, 2, 3 \dots n$$

The model in Poisson regression for each observation y_i (i= 1, 2, 3…n) can be written as

E (y_i) = λ_i where λ_i is the mean number of child-mortality in time t_i. Hence,

ln (E (y_i)) = ln (λ_i) = $\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 \dots \dots \dots \dots + \beta_n x_n$

It is denoted as Poisson regression model for the number of child mortality in India with n independent covariates.When Poisson regression is applied to binomial data, the error for the estimated relative risk will be overestimated[15] (Zou, 2004). However, this problem may be rectified by using a robust error variance procedure known as sandwich estimation[16], thus leading to a technique that we refer to as Modified Poisson Regression.Assume that subject *i* has an underlying risk that is a function of x_i, say π (x_i). Because π (x_i) must be positive, the logarithm link function is a natural choice for modeling π (x_i), giving

log [π (x_i)] = α + βx_i.

The relative risk (RR) is then given by exp (β). If a Poisson distribution is assumed for y_i, the log-likelihood is given by (Subramanian etal. 2009)

l (α, β) = C.$\sum$ y_i[(α + βx_i) – exp (α + βx_i)], [i=1, 2 …n]

where *C* is a constant. Application of standard likelihood theory yields-

exp (α') = c/n_0

Relative-Risk(RR) = exp (β) = an_0/cn_1

With the estimated of variance RR' is given by

Var (RR') = 1/a+1/c

Variable Descriptions

Dependent Variables: To study the child-mortality and its association with covariates, the researchers considered neonatal, infant and under-5 mortalities in India as dependent variables.

Choice of Independent Variables: In this type of study, the choice of covariates is very important. An inappropriate choice of independent variable may results misleading the conclusions therefore choice of suitable independent variables is very crucial. The basic requirement in selecting the variables is that the independent and dependent variable(s) should be highly correlated.

Authors have considered a number of predictors to explain neonatal, infant and child mortality. These mortalities are determined by both the biological endowment of children at birth and their environment after birth. Recently it has been found that child mortality has been declining in India as well as all over the world, partly as a result of development in medical science and technology as well as improvement in living conditions of the people. The neonatal, infant and child mortality may be influenced by parameters related to child, a set of socioeconomic characteristics, a set of demographic characteristics, and a set of predictors related to mother's health-care behaviour. For this study, the researchers divided all the covariates related to child mortality in to the following three categories:

1.   **Mother Covariates**: Past studies indicate, some characteristics related to mother like anthropometric height of women, maternal age at birth, education of mother etc. are known to affect the neonatal, infant and child mortality rate. The categorizations of maternal height are taken from a study conducted by Subramanian[17] i.e. ≥160, 155-159.9, 150-154.9, 145-149.9, and <145 in centimeter. The predictor maternal age at birthis categorized in four groups (<18 years, 18-24 years, 25-29 years and ≥30 years).Same classification of mother education is considered as given in NFHS.

2.   **Household Covariates**: In general, household characteristics are expected to have stronger effects on post-neonatal and child mortality than on neonatal. In developing countries, household characteristics such as residential status (urban/rural), Caste, religion, household economic status are likely to affect a child's condition at birth as well as its environment, thus affecting infant and child

mortality. In this study, household covariates werecaste, religion, wealth-index and place of residence[17,18].

3.   Child Covariates:Child covariates were consideredbirth-order and sex of child at birth[17].In this study, authors first estimated the unadjusted association of neonatal, infant, and under-5 mortalities with each covariate using modified poisson regression models that include just one predictor variable. Adjusted effects are also calculated in two situationsi.e. excluding and including maternalheight.

Findings and Discussion

Table 1 shows descriptive statistics of neonatal mortality, infant mortality and under-five mortality with mother's covariates (maternal height, maternal age at birth, and maternal- educational level), child's covariates (birth-order and sex of the child) and household's covariates (caste, religion, wealth-index and place of residence) in India using NFHS-4 data. Neo-natal mortality, Infant mortality and Under-5 mortality was 7,405(1.06%), 10,834(1.55%) and 13,245(1.89%) respectively for India. Table indicate that the percentage of neo-natal, infant and under-5-year mortality decreases as height of women-group increases from 150-154.9 cm and minimum for ≥ 160 cm i.e. 6.03 per cent, 6.07 per cent and 5.90 per cent respectively. For Maternal-age at birth, the percentage of neo-natal, infant and under-5 mortality getting decreases as the age at birth of women increases from 18-24 year group. And highest for 18-24 years group women i.e. 39.56 per cent, 39.71 per cent and 39.03 per cent respectively. In case of maternal education, neo-natal mortality, infant mortality and under-5 mortalities is highest in no-educated women i.e. 49.32 per cent, 50.63 per cent and 52.67 per cent respectively and lowest in higher educated women group i.e. 4.15 per cent, 3.90% and 3.46% for respective mortalities group. The percentage of neo-natal, infant and under-5 mortalities is highest in the women having 4+ birth-orders i.e. 37.60 per cent, 38.77 per cent and 40.43 per cent respectively. Similarly, the percentage of child-mortalities is more for male child i.e. 55.93 per cent, 53.31 per cent and 52.93 per cent respectively.In household covariates, the percentage of child-mortalities is highest in OBC category women followed by SC/ST women and lowest in Others categories women. For wealth-index, there is a negative relationship between wealth-quintiles and child mortalities i.e. as their wealth-index improves the percentage of neo-natal mortality, infant mortality and under-5 mortality decreases. The percentage is highest in poorer wealth-quintile women i.e. 30.13 per cent, 29.74 per cent and 30.22 per cent respectively and lowest in richest wealth-quintile women i.e. 10.68 per cent, 10.38 per cent and 10.10 per cent respectively.For place of residence, the percentage of neo-natal, infant and under-5 mortalities is higher among rural women i.e. 76.04 per cent, 75.86 per cent and 75.89 per cent respectively.

Table 1
Descriptive Statistics for Neonatal Mortality, Infant Mortality and Under-5 Mortality with Covariates of India (NFHS-4)

Covariates	Child Mortalities		
	Neonatal Mortality (0–1 month) N (%)	Infant Mortality (0–11 months) N(%)	Under-5 Mortality (0-59 months) N(%)
Prevalence	7,405 (1.06%)	10,834 (1.55%)	13,245 (1.89%)
Mother's covariates			
Maternal height, cm			
≥160	443 (6.03%)	652 (6.07%)	774 (5.90%)
155-159.9	1,116 (15.18%)	1,684 (15.67%)	2,039 (15.53%)
150-154.9	2,311 (31.43%)	3,430 (31.92%)	4,226 (32.20%)
145-149.9	2,179 (29.63%)	3,168 (29.48%)	3,918 (29.84%)
<145	1,304 (17.73%)	1,811 (16.86%)	2,169 (16.53%)

Maternal age at birth, years			
<18 years	246 (3.40%)	388 (3.66%)	476 (3.67%)
18-24 years	2,869 (39.56%)	4,213 (39.71%)	5,062 (39.03%)
25-29 years	2,214 (30.53%)	3,222 (30.37%)	3,938 (30.36%)
≥30 years	1,923 (26.51%)	2,787 (26.26%)	3,495 (26.94%)
Maternal Education level			
No education	3,652 (49.32%)	5,485 (50.63%)	6,975 (52.67%)
Primary	1,200 (16.21%)	1,757 (16.22%)	2,138 (16.14%)
Secondary	2,245 (30.32%)	3,169 (29.25%)	3,672 (27.73%)
Higher	307 (4.15%)	422 (3.90%)	459 (3.46%)
Child covariates			
Birth Order			
1	1,584 (21.39%)	2,103 (19.41%)	2,288 (17.28%)
2	1,490 (20.12%)	2,249 (20.76%)	2,745 (20.73%)
3	1,546 (20.89%)	2,281 (21.06%)	2,855 (21.56%)
4+	2,784 (37.60%)	4,199 (38.77%)	5,355 (40.43%)
Sex of the child			
Male	4,056 (55.93%)	5,657 (53.31%)	6,866 (52.93%)
Female	3,196 (44.07%)	4,954 (46.69%)	6,107 (47.07%)
Household Covariates			
Caste			
SC/ST	2,479 (34.65%)	3,672 (35.16%)	4,624 (36.18%)
OBC	3,332 (46.57%)	4,835 (46.29%)	5,845 (45.74%)
Others	1,344 (18.78%)	1,938 (18.55%)	2,310 (18.08%)
Religion			
Hindu	6,055 (81.81%)	8,828 (81.55%)	10,857 (82.04%)
Muslim	1,066 (14.40%)	1,543 (14.25%)	1,829 (13.82%)
Christian	99 (1.37%)	175 (1.62%)	210 (1.59%)
Others	181 (2.42%)	279 (2.58%)	338 (2.55%)
Wealth Index			
Poorest	2,231 (30.13%)	3,221 (29.74%)	4,002 (30.22%)
Poorer	1,787 (24.13%)	2,613 (24.13%)	3,220 (24.31%)
Middle	1,495 (20.19)	2,217 (20.47%)	2,637 (19.91%)
Richer	1,099 (14.84%)	1,656 (15.28%)	2,047 (15.46%)
Richest	791 (10.68%)	1,125 (10.38%)	1,337 (10.10%)
Place of Residence			
Urban	1,774 (23.96%)	2,615 (24.14%)	3,193 (24.11%)
Rural	5,631 (76.04%)	8,219 (75.86%)	10,052 (75.89%)

$$**\% = \frac{Death\,in\,that\,particular\,category}{Total\,population\,of\,that\,group} *100$$

Table 2 shows the relative-risk of neonatal mortality with mother's covariates, child's covariates and household's covariates for India by using poisson regression model. In adjusted poisson regression,there are two adjusted models(Model-I-without considering maternal height and Model II-including maternal height). Since, the objective of the study is to access the impact of considered covariates on child-mortality and the inclusion of some factors (mother's age at birth, caste and place of residence) leads to lose the impacts of maternal-height as well as other socio-demographic characteristics of females which she holds by her birth.Past studies indicate that the maternal height plays an important role in child-mortality which reflect from the table also, the relative risk for neonatal mortality increases as height decreases simultaneously and it is significant for almost every group of

height from both the unadjusted and adjusted effect models and relative-risk is highest for maternal height less than 145 cm women heighti.e. 2.240 times and 1.691 times as compared to height more than 160 cm. For maternal age at birth, the relative-risk of neonatal mortality is high for less than 18 years women andmore than 30 years women but situation is poor for women age at birth more than 30. For maternal educational-level, the relative risk of neonatal mortality decreases as their education increases and it is significant for all primary, secondary and higher groups and risk is less among higher educated mother. For birth-order, the relative risk of neonatal mortality increases as their birth order increases and significant for both the models and risk is high for 4+ birth order i.e. 1.469 timesas compared to first birth-order. For sex of the child at birth, the relative risk of neonatal mortality is 1.125 times more chance for female-child as compare to male-child from unadjusted model and 10 percent more chances for females as compared to male child at birth from adjusted effect. For household covariates, the relative risk for neonatal mortality for OBC have 19 percent less chance as compared to SC/ST women and Others have 0.792 times less chance as compared to SC/ST women from the unadjusted effect model. The unadjusted model shows that relative-risk for neonatal mortality for Muslim community had 36 per cent more chances as compared to Hindu community.In respect of wealth index, the relative-risk of neonatal mortality decreases as the wealth-index improves from poorest to richest means there is negative relationship with neo-natal mortality from both unadjusted and adjusted models. The relative-risk of neonatal mortalityfor rural women is 46 percent more chance as compared to urban women from the unadjusted effect model.In the adjusted model, all the predictor variables contribute to maximize the pseudo-likelihood of the model and it is observed that in Model-II, pseudo-likelihood is getting reduced after considering the maternal height as a predictor. It indicates that Model-II provides a better explanation for neonatal mortality with proposed predictor i.e. maternal height show a significant impact on the neonatal-mortality.

Table 2
Modified Poisson Regression for Neonatal Mortality with Covariates of India

Covariates	For Neo-natal mortality								
	Unadjusted Model			Adjusted Model 1*			Adjusted Model 2+		
	RR	P>|z|	95% CI	RR	P>|z|	95% CI	RR	P>|z|	95% CI
Mother's covariates									
Maternal height, cm									
>160	Ref								
155-159.9	**1.094**	0.072	0.991- 1.208	-			**1.001**	0.979	0.900- 1.113
150-154.9	**1.343**	0.000	1.222- 1.476	-			**1.131**	0.014	1.024- 1.248
145-149.9	**1.628**	0.000	1.481- 1.790	-			**1.285**	0.000	1.162- 1.420
<145	**2.240**	0.000	2.031- 2.472	-			**1.691**	0.000	1.520- 1.882
Maternal age at birth, years									
<18 Years	Ref								
18-24 years	**0.838**	0.011	0.731- 0.960						
25-29 years	**0.920**	0.240	0.802- 1.056						
≥ 30 Years	**1.423**	0.000	1.240- 1.633						
Maternal educational level									
No education	Ref								
Primary	**0.764**	0.000	0.727- 0.803	**1.026**	0.423	0.962-1.095	**1.022**	0.494	0.958- 1.091
Secondary	**0.367**	0.000	0.352- 0.383	**0.848**	0.000	0.797-0.903	**0.856**	0.000	0.804- 0.912
Higher	**0.215**	0.000	0.198- 0.233	**0.712**	0.000	0.624-0.813	**0.732**	0.000	0.640- 0.837
Child covariates									
Birth Order									
1	Ref								

2	**0.537**	0.000	0.506- 0.570	**0.527**	0.000	0.491-0.565	**0.532**	0.000	0.496- 0.572
3	**0.805**	0.000	0.758- 0.854	**0.710**	0.000	0.660-0.764	**0.714**	0.000	0.663- 0.769
4+	**1.469**	0.000	1.392- 1.550	**1.162**	0.000	1.085-1.244	**1.162**	0.000	1.085- 1.245
Sex of the child									
Male	Ref								
Female	**1.125**	0.000	1.083- 1.169	**1.107**	0.000	1.058-1.157	**1.100**	0.000	1.052- 1.151
Household Covariates									
Caste									
SC/ ST	Ref								
OBC	**0.981**	0.473	0.933- 1.032						
Others	**0.792**	0.000	0.743- 0.845						
Religion									
Hindu	Ref								
Muslim	**1.036**	0.266	0.973- 1.104	**1.044**	0.177	0.980- 1.113	**1.063**	0.060	0.997- 1.133
Christian	**0.557**	0.000	0.499- 0.621	**0.591**	0.000	0.529- 0.660	**0.593**	0.000	0.530- 0.662
Others	**0.652**	0.000	0.575- 0.740	**0.780**	0.000	0.687- 0.884	**0.806**	0.001	0.710- 0.914
Wealth Index									
Poorest	Ref								
Poorer	**0.751**	0.000	0.714- 0.790	**0.856**	0.000	0.806- 0.909	**0.872**	0.000	0.821- 0.926
Middle	**0.566**	0.000	0.536- 0.597	**0.717**	0.000	0.670- 0.767	**0.750**	0.000	0.700- 0.802
Richer	**0.441**	0.000	0.416- 0.468	**0.606**	0.000	0.561- 0.655	**0.648**	0.000	0.599- 0.701
Richest	**0.343**	0.000	0.322- 0.365	**0.529**	0.000	0.482- 0.581	**0.577**	0.000	0.525- 0.634
Place of Residence									
Urban	Ref								
Rural	**1.469**	0.000	1.396- 1.545						
-Log pseudo-likelihood				38485.000			37920.593		

Table 3describes the relative-risk of infant mortality with mother's covariates, child's covariates and household's covariates for India. Table shows that the relative risk of infant mortality increases as height decreases simultaneously and it is significant for almost every group of height from both the effect and the relative-risk is highest for less than 145 cm women groupi.e. 2.123 times from unadjusted effect and 1.586 times from adjusted effect as compared to height of women greater than 160 cm. This table indicates that the relative-risk of infant mortality increases as the age of mother increases and it is significant for all categories and highest for mother age greater than 30 years. For maternal educational-level, the relative risk of infant mortality decreases as their education increases and it is significant for all primary, secondary and higher groups from the model and risk is low among higher educated mother. The relative risk of infant- mortality increases as their birth-order increases and significant for each category from both the models and risk is high for 4+ birth orders is 1.706 times from unadjusted effect and 1.32 times from adjusted effect. For sex of the child at birth, the relative risk of infant mortality is 1.217 times for females-child from adjusted effect & 1.197 timesand 1.191 times for females in adjusted effect as compared to male child at birth. Table indicates thatfor caste, the relative risk of infant mortality is significant for all categories i.e. for OBC have 0.921 times less chance and others have 0.750 times less chance as compared to SC/ST women from the unadjusted effect model. For religion, the relative-risk of under-five mortality for Muslim community had 28 percent more chance from unadjusted effect and 19% & 37% more chance from adjusted effect as compare to Hindu community and significant for Christian and Others from both the models. For wealth index, the relative-risk of infant mortality decreases as the wealth-index improves from poorest to richest means there is negative relationship from both the effect. For place of residence, the relative-risk of under-five mortality for rural women is 1.476 times more chances as compared to urban women from unadjusted effect model. In the adjusted model, all the predictor variables contribute to maximize the pseudo-likelihood of

the model and it is observed that in Model-II, pseudo-likelihood is getting reduced after considering the maternal height as a predictor. It indicates that Model-II provides a better explanation for infant mortality after consideration of maternal height. It shows maternal height has a significant impact on the infant-mortality.

Table 3
Modified Poisson Regression for Infant Mortality with Covariates of India

Covariates	For infant mortality								
	Unadjusted Model			Adjusted Model 1*			Adjusted Model 2+		
	RR	P>|z|	95% CI	RR	P>|z|	95% CI	RR	P>|z|	95% CI
Mother's covariates									
Maternal height, cm									
>160	Ref								
155-159.9	**1.122**	0.005	1.034- 1.216	-			**1.020**	0.650	0.935-1.112
150-154.9	**1.349**	0.000	1.249- 1.458	-			**1.126**	0.004	1.038-1.220
145-149.9	**1.608**	0.000	1.488- 1.739	-			**1.255**	0.000	1.156-1.362
<145	**2.123**	0.000	1.958- 2.302	-			**1.586**	0.000	1.453-1.732
Maternal age at birth, years									
<18 Years	Ref								
18-24years	**0.778**	0.000	0.698- 0.868						
25-29 years	**0.873**	0.016	0.782- 0.974						
≥ 30Years	**1.354**	0.000	1.213- 1.512						
Maternal educational level									
No education	Ref								
Primary	**0.738**	0.000	0.709-0.769	**0.979**	0.439	0.928- 1.032	**0.977**	0.408	0.927-1.031
Secondary	**0.351**	0.000	0.338- 0.363	**0.805**	0.000	0.765- 0.848	**0.811**	0.000	0.771-0.854
Higher	**0.191**	0.000	0.177- 0.205	**0.646**	0.000	0.577- 0.723	**0.662**	0.000	0.591-0.742
Child covariates									
Birth Order									
1	Ref								
2	**0.608**	0.000	0.577- 0.639	**0.594**	0.000	0.560- 0.631	**0.600**	0.000	0.565-0.637
3	**0.928**	0.004	0.882- 0.977	**0.813**	0.000	0.764- 0.865	**0.817**	0.000	0.768-0.869
4+	**1.706**	0.000	1.629- 1.787	**1.329**	0.000	1.255- 1.408	**1.328**	0.000	1.254-1.407
Sex of the child									
Male	Ref								
Female	**1.217**	0.000	1.180-1.256	**1.197**	0.000	1.154- 1.241	**1.191**	0.000	1.148-1.235
Household Covariates									
Caste									
SC/ ST	Ref								
OBC	**0.921**	0.000	0.884-0.960						
Others	**0.750**	0.000	0.711-0.792						
Religion									
Hindu	Ref								
Muslim	**1.028**	0.289	0.976- 1.084	**1.019**	0.464	0.967- 1.075	**1.037**	0.179	0.983-1.093
Christian	**0.760**	0.000	0.703- 0.822	**0.808**	0.000	0.746- 0.875	**0.811**	0.000	0.749-0.878
Others	**0.686**	0.000	0.619- 0.760	**0.823**	0.000	0.743- 0.911	**0.842**	0.001	0.760-0.933
Wealth Index									
Poorest	Ref								
Poorer	**0.753**	0.000	0.722-0.785	**0.866**	0.000	0.824- 0.910	**0.880**	0.000	0.837-0.925
Middle	**0.585**	0.000	0.559-0.611	**0.756**	0.000	0.715- 0.798	**0.784**	0.000	0.741-0.828
Richer	**0.455**	0.000	0.434- 0.477	**0.650**	0.000	0.610- 0.692	**0.687**	0.000	0.645-0.733

	RR	P>|z|	95% CI	RR	P>|z|	95% CI	RR	P>|z|	95% CI
Richest	**0.337**	0.000	0.320- 0.355	**0.555**	0.000	0.514- 0.600	**0.597**	0.000	0.552-0.645
Place of Residence									
Urban	Ref								
Rural	**1.476**	0.000	1.416- 1.540						
- Log pseudo-likelihood				52197.148			51474.003		

Table 4explains therelative risk of under-five mortality with above considered three types of covariates. For maternal height, the relative risk for under-5 mortality increases as height decreases and it is significant for almost every group of height from both the unadjusted and adjustedmodels and it is highest for women having height less than 145 cm as compared to tallest women. Table indicates that the relative-risk of under-5 mortality increases as age increases and it is significant for all categories which has support of literatures. The risk is high among women of age more than thirty years. For maternal educational-level, the relative risk of under-five mortality decreases as their education increases.The mortality risk in child is low among higher educated mother. The relative risk of under-five mortality increases as birth order increases for women and it was found that risk is high for 4+ birth order female i.e. 1.996 times compared to first order of female. For sex of the child at birth, the relative risk of under-five mortality is 1.225 times more chance for females-child at birth as compared to male child at birth. The relative risk of under-five mortality varies for all categoriesof caste. For wealth index, the relative-risk of under-mortality decreases as the wealth-index improves from poorest to richest means there is negative relationship from both the effect. For place of residence, the relative-risk of under-five mortality for rural women is 1.525 times more chance as compared to urban women from the unadjusted effect model. In the adjusted model, all the predictor variables contribute to maximize the pseudo-likelihood of the model and it is observed that in Model-II, pseudo-likelihood is getting reduced after considering the maternal height as a predictor.

Table 4
Modified Poisson Regression for Under-five Mortality with Covariates of India

Covariates	For under-5 mortality								
	Unadjusted Model			**Adjusted Model 1***			**Adjusted Model 2[+]**		
	RR	P>|z|	95% CI	RR	P>|z|	95% CI	RR	P>|z|	95% CI
Mother's covariates									
Maternal height, cm									
>160	Ref								
155-159.9	**1.136**	0.001	1.055- 1.222	-			**1.026**	0.517	0.948-1.110
150-154.9	**1.385**	0.000	1.290- 1.486	-			**1.140**	0.000	1.059-1.226
145-149.9	**1.645**	0.000	1.532- 1.766	-			**1.258**	0.000	1.167-1.355
<145	**2.113**	0.000	1.963- 2.275	-			**1.539**	0.000	1.421-1.667
Maternal age at birth, years									
<18 Years	Ref								
18-24years	**0.769**	0.000	0.697- 0.849						
25-29 years	**0.883**	0.014	0.799- 0.975						
≥ 30Years	**1.384**	0.000	1.253- 1.529						
Maternal educational level									
No education	Ref								
Primary	**0.709**	0.000	0.684- 0.736	**0.945**	0.021	0.901-0.991	**0.943**	0.017	0.899-0.989
Secondary	**0.317**	0.000	0.307- 0.328	**0.745**	0.000	0.711-0.781	**0.751**	0.000	0.716-0.787
Higher	**0.163**	0.000	0.152- 0.174	**0.577**	0.000	0.519-0.642	**0.591**	0.000	0.531-0.658

Child covariates									
Birth Order									
1	Ref								
2	**0.685**	0.000	0.653-0.718	**0.664**	0.000	0.628-0.701	**0.670**	0.000	0.634-0.708
3	**1.077**	0.002	1.027- 1.130	**0.922**	0.005	0.871-0.976	**0.926**	0.009	0.875-0.981
4+	**1.996**	0.000	1.911- 2.085	**1.503**	0.000	1.425-1.585	**1.501**	0.000	1.423-1.584
Sex of the child									
Male	Ref								
Female	**1.225**	0.000	1.191- 1.260	**1.207**	0.000	1.168-1.247	**1.201**	0.000	1.162-1.241
Household Covariates									
Caste									
SC/ ST	Ref								
OBC	**0.902**	0.000	0.869- 0.936						
Others	**0.712**	0.000	0.678- 0.747						
Religion									
Hindu	Ref								
Muslim	**0.982**	0.482	0.936-1.031	**0.964**	0.146	0.919-1.012	**0.980**	0.430	0.933-1.029
Christian	**0.778**	0.000	0.725-0.834	**0.839**	0.000	0.782-0.900	**0.843**	0.000	0.786-0.905
Others	**0.694**	0.000	0.634-0.761	**0.844**	0.000	0.771-0.925	**0.865**	0.002	0.789-0.948
Wealth Index									
Poorest	Ref								
Poorer	**0.733**	0.000	0.707- 0.761	**0.858**	0.000	0.821-0.897	**0.871**	0.000	0.833-0.910
Middle	**0.562**	0.000	0.540- 0.584	**0.750**	0.000	0.714-0.788	**0.775**	0.000	0.737-0.814
Richer	**0.434**	0.000	0.415- 0.453	**0.653**	0.000	0.616-0.691	**0.686**	0.000	0.647-0.726
Richest	**0.313**	0.000	0.299- 0.329	**0.557**	0.000	0.520-0.598	**0.595**	0.000	0.555-0.639
Place of Residence									
Urban	Ref								
Rural	**1.525**	0.000	1.468- 1.584						
-Log pseudo-likelihood				60873.06			60038.935		

Conclusion

Based on our analysis of nationally representative sample for India, we found that mother's, child and household covariates played a significant role for neonatal, infant and under-5 mortality in India. For mother' covariates, maternal height was prominent risk- factor for child-mortality and it was found that maternal height was inversely associated with neonatal, infant and under-five mortality. Our results showed robust evidence that short maternal stature substantially increased the risk of child mortality compared with taller maternal height and it was also found that poorest household had higher proportion of short height as compare the rich household in India.Above analysis indicates that maternal age at birth may also play an important role to explain all types of child-mortality. Similarly, mother's education also played a significant role for reducing child-mortality as their education increases the risk of neonatal, infant and under-five mortality decreases.Sex-differential in child-mortality reflects son-preference in India, the finding of the study showed that by reducing the proportion of higher-order births will tends to lower neonatal and child mortality.The unadjusted effects of household characteristics on child-mortality, as estimated by Poisson regression model i.e. SC/ST household, Rural residences, Poor household etc. all of these variables have strong unadjusted effects on neonatal, infant and under-five mortality rate and it was found that OBC and Others had low risk of child-mortality as compared to SC/ST. In religion, Christian and Others had low risk as compare to Muslim community. The study concludes that there was inverse relationshipchild-mortality with wealth index. For place of residence, urban population had low risk as compare to rural population.Although, it is not possible to make all household for reducing child-mortality suddenly, the Family health program

can used to improve child-survival by targeting Families at high risk. The results of this study indicates that health programme should be focused on Poorer and Poorest households, Illiterate mothers, SC/ST households, Muslim's population and females with rural belongings as an underlying cause of child mortality in India.

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Relationship of Stress Variables with Reduction of Job Satisfaction Level of Nurses during COVID-19 Period

*Amit Mahajan, ** Parul Jhajharia and *** Bishan Singh Nagi

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*Scholar, E-mail: mahajanamit2014@gmail.com; **Professor, Manav Rachna University, Faridabad.
***Former Director of Research, CSD, New Delhi.

Abstract

The study was carried out on 148 nurses selected from the selected Covid-19 designated hospitals in Delhi. A standardized tool (Perceived Stress Scale) was used for data collection. There are 10 statements of stress due to working in the gloomy and stressful atmosphere during COVID-19 period (December 2020). The eleventh statement was the perception of respondents on the reduction in job satisfaction level due to COVID -19. The percentage of respondents is quite high in each statement who felt stress due to working among the COVID-19 patients. The percentage of respondents is also quite high who felt reduction in job satisfaction level due to treating the COVID-19 patients. There is also significant relationship (correlation coefficient) of eight statementsof stress with the reduction of job satisfaction level.The findings suggest that during such pandemic situation (highly infectious disease with no known cure), those who are directly in touch with patients also felt reduction in job satisfaction.

Keywords: Stress variables, Job satisfaction, Nurses, COVID-19.

Introduction

Job related stressorsare becoming a common citing in most organizations. In reaction to the factors related to work environment, culture and ambiance and expectations, employees form an emotional response which could be a satisfaction or dissatisfaction[1]. Fisher[2] said that when the work expectations are beyond individual's personal skill set or emotional state, they result in stress. One's personality, values, beliefs, physical or emotional condition may all contribute to the stress. American Institute of Stress (AIS) studied stress conditions at workplace and concluded that job stress is often an important reason behind 80 per cent of injuries related to job and it causes workflow disruptions up to 40 per cent[3]. Organisations tend to lose in terms of employee productivity and organisational performance as a result of the stress. Zamanian et al.[4] noted that over 1.1 million people lose their jobs as a result of the stress they face while at work. Job stress is known to occur among people from all ages, professions and organisations but it is observed more among people involved in nursing profession[5,6].

According to a study[7] conducted by Dagget et al., upto 68 per cent of nurses may indicate symptoms of depressions for reasons owing to their profession or working conditions. The reasons behind their stressful condition may be physical, psychological or social. The job-related stress among nurses may manifest in form of physical symptoms like increased heartbeat, blood pressure etc. or psychologically in the form of anxiety, lack of concentration[8]. It may also hamper employee's personal performance or organisational performance owing to increased absenteeism, employee turnover, poor motivation and other such factors[2,9]. Owing to increased stress due to work related factors, employee may witness poor job satisfaction[10,11].

Molla[12] defines job satisfaction as the pleasant feeling that employee observes while working at any job. Every employee has certain expectations from its employer and needs to fulfill from the employment. If such needs are fulfilled, employee feel satisfied and vice versa. When employee is satisfied, they feel more confident and display lower stress levels and good mental and emotional condition. Factors such as salary, work hours, work environment, culture, personal health conditions, own personality are known to have influenced employee job satisfaction[13].

Nurses expect the employer to provide supportive and conducive work culture with fair amount of compensation[14]. Any instance which disturbs this balance is likely to dissatisfy the employee leading to stress[10]. Scholars like, Alipour & KamaeeMonfared[15], Fisher[2] and Ramli[16] opined that a stressed employee is expected to be less focused, less motivated and less dedicated toward his/her work. This may adversely affect his/her performance and job satisfaction. Given the high instance of stress among nurses working in the area of healthcare, there is a need to investigate into the factors leading to stress and job-satisfaction among nurses[17]. By understanding the factors affecting job satisfaction among nurse and the way these factors affect employee satisfaction, management can make more informed and effective policies to prevent job dissatisfaction in healthcare scenario. By improving job satisfaction, the management would be able to enhance the organisational performance by improving employee productivity, reducing absenteeism and employee turnover[16]. COVID-19 has put intense pressure on the healthcare infrastructure and the people related with it. Nurses have been at the frontend of this stressful situation. Present study investigated the stress levels among nurses during the pandemic situation and to understand how and to what extent has this pandemic related stress affected the job satisfaction among nursing staff.

When this article started, India was introduced with the incoming pandemic wave. On May 2021, India reported a staggering 400000 cases of COVID-19 with a strong anticipation that the situation will only get worse given the high population density of the country. As the cases surged, hospitals, nursing homes, mortuaries, cremation grounds were all overwhelmed with the scale with which the pandemic hit the country. The situation led to shortage of beds, cremation grounds, medicines, doctors and nursing staff. Things got worse when healthcare workers, doctors and nurses started getting infected. Incidence of anxiety and stress increased among nurses, doctors and healthcare staff. Researcher was under the process of writing this article on stress among nursing staff when the first wave ended in December, 2020 but when the second wave of pandemic started, researcher got a chance to study how stress affected job satisfaction of the nursing staff working in Delhi, India.

The pandemic started as Wuhan, China in late 2019 through a virus named Novel Coronavirus. The World Health Organisation (WHO) declared it a worldwide pandemic on 11th of March, 2020. Pandemic not only caused loss of life but also gave rise of several other problems like unemployment, job stress, change in lifestyle, stress and anxiety etc. Among others, the healthcare workers (HWCs) were the worst affected ones because they were the first respondents to the situation. The nursing staff and the doctors who were nursing or caring the Covid-19 patients were more prone to infection compared to other frontline workers. This is causing anxiety, stress, work related burnout, depression and fear among most of them.

The fear of getting infected, increased workload, and shortage of staff and medicines have only increased stress among healthcare workers. On the social level, the nursing staff caring a COVID-19 patient also fears the risk of isolation for their family members and the society, even discrimination. This led to increased stress levels among HWCs. Stress is known to decrease the decision-making ability, emotional response to stressful situations, increased chances of error and insufficient patient care. Studying previous disaster situations, it was concluded that under condition of disaster, people feel lasting effects. Given the scale of pandemic that India and the world has witnessed, it is important to

understand what mental effects has this pandemic yielded and in what manner. The present research is an attempt to understand the stress levels experienced by the nursing staff working in tertiary hospitals in Delhi, India during the second wave of the pandemic and its impact on job satisfaction.

Review of Literature

Nurses are expected to take care of all the primary nursing needs of patients admitted for medical assistance. Additionally, nurses are also expected to assist the doctors, therapists, medical technicians and administrators[16]. Clearly, their job is not easy and is likely to generate a lot of stress. Given the nature of their job, this stress is constant and is likely to lead to several mental, emotional and physical exhaustion[17]. The stress is expected to increase in conditions like staggered or extended working hours, insufficient equipment or medication, space crunch and in pandemics[6]. Shah et al.[14] said that while nature of job demands nurses to handle stress, they may not be emotionally equipped to handle the situation.

Given the fact that job dissatisfaction can affect nurses' emotional and physical condition and overall performance it is vital to handle this stress effectively[15]. Moreover, stress may lead to absenteeism, employee turnover, lack of focus among nurses. Employee turnover observed in nursing profession is fairly high which not only increases the workload but also decreases the organisational effectiveness[18]. Researchers like Fasbender et al.[18], Lee and Jung[11], Shah et al.[14] have observed increased instance of job dissatisfaction among nursing staff and have started to give it greater importance. Most scholars observe that this area of research still needs further investigation and understanding. Researchers need to understand what leads to stress and how this stress can lead to physical, emotional and psychological implications for the employee and the organisation[14].

Researchers note that employee job satisfaction is a multidimensional concept wherein multiple forces act upon each other[18]. Researchers like Lee and Jung[11], Shah et al.[14]Fasbender et al.[18], Al Maqbali[19]and Karem et al.[20] in the past have identified several factors known to have affected job satisfaction among nurses. The factors may vary from the environmental factors to personality traits of the working professionals. Some have also identified working conditions and work culture as some such factors. Working environment, policies, supervision etc. are some environmental factors while compensation, degree of autonomy, job outcomes etc. are some characteristic aspects. Similarly, work culture, growth prospects, equipment etc. are some work-related factors.

It is important to understand the various variables affecting job satisfaction and how they affect this to effectively and efficiently run any healthcare organisation. A lot may be at stake with increasing job satisfaction and employee attrition at most hospitals[14]. Colquitt et al.[1] noted that although stress is an integral part of the healthcare professional, the way an individual responds to it and get affected may differ. Stress amongst the staff in healthcare organisations is clearly much higher because hospitals deal with lives of the patients under treatment mostly ill enough to not to take care of themselves[5]. Gulavani and Shinde[10] notedthat although the stressors and stress indicators may be plenty, it is possible to identify them. Similarly, the way nurses respond to this stress may also differ from person to person. Nursing is a profession in which the patient care is provided using continuous observation, medical attention, medicinal observation and personal care. A nurse needs to be a multitasker and a team player[11].

As noted by Al Maqbali[19] most commonly observed stressors among nurses were disagreement with physicians, lack of preparedness, peer pressure, lack of supervisory support, staggered or long working hours, uncertainty in treatment, deteriorating patient condition and personal and family problems. Other stressors identified were poorly planned workload, management apathy, professional disagreements

and emotional dissatisfaction. Sharma et al.[5] noted that stress is the second most commonly observed occupational hazard among the nurses in India.

In order to improve their efficiency and accommodate the new technology and need for patient care, hospitals worldwide are undergoing several changes. Often such changes involved restructuring employment, hierarchy, technology used, lay-offs etc. leading to additional workload[17]. The changes in the practices due to technology adopted may demand changes in work schedule. All these only add to the already stressed working conditions of nursing professionals and may result in behavioral, emotional and physical challenges. Fasbender et al.[18] established empirical evidences suggesting direct and positive relationship between stress and job satisfaction among nurses. It is noted that a prolonged exposure to such stressors can elevate employee intention to quit job or even profession[15,18]. Present research is conducted to research deeper into the level of stress among nurses and evaluate how job-related stressors, as perceived by nurses, affect job satisfaction. Since, present study is conducted during pandemic, researcher assumes that most of the stressors are related with the pandemic crisis.

Objectives

The primary objectives of the current research are to study
i.   the stress level of the nurse respondents working in the COVID-19 designated multi-specialty tertiary level hospitals in Delhi (India),
ii.   the reduction of job satisfaction levelof nurse respondents due to COVID -19, working in the COVID-19 designated multi-specialty tertiary level hospitals in Delhi (India).
iii.   the relationship of stress variables with the 'Reduction of job satisfaction level due to COVID-19 variable of the respondents.

Methodology

Research Design: The research design applied to the study is Single Cross-Sectional Descriptive Research Design. In such research designs, the sample is drawn only once and data collection is also done only once. The findings of the study variables are interpreted in detail.

Sampling: Two COVID -19 designated private multi-specialty tertiary level hospitals were selected purposively. The respondents (nurses) were selected during last week of December 2020 when the intensity of COVID -19 cases in Delhi recorded quite low. The respondents were selected randomly with the help of systematic random sampling technique from the list of nurses provided by the hospitals. The number of selected respondents was 175, but due to unavailability of some of them, the actual data were collected from 148 respondents.

Tools of Data Collection: A standardized stress measuring scale(Perceived Stress Scale) was used for data collection. The number of statements pertaining to stress of the scale is 10 and the 11th statement was measuring the 'Reduction of Job Satisfaction Level due to Covid-19'. Each statement is measured on three points, that 1, 2, 3 – Disagree, Neutral and Agree respectively. Scoring of four statements of Stress were reversed as these were negative statements. These statement serial numbers are 4, 5, 7, and 8. The requisite information from 148 sampled respondents was gathered with the help of the 'Perceived Stress Scale (PSS-10)'.

Analysis and Interpretation

As mentioned above the requisite information collected from the 148 respondents was first manually checked, and recoding of some of the variables was done. Then the data was entered in the computer with the help of MS-Excel software. The Statistical Package for Social Sciences (SPSS) was used to carry out the required statistical analysis. The finding of the analysis have been tabulated and presented below in tables. The results given in the tables are deliberated of each variable.

Frequency Distribution

Statement 1 - From the Table-1 it is absolutely clear that only 38.5 per cent of the respondents did not feel upset at all, it means that rest of them were upset due to the fact that they are treating COVID -19 patients in the hospitals. It is further noticed from the table that 18.1 per cent agreed that they felt upset because of something happened unexpectedly during the last month (COVID -19 period). On the other hand, major portion of the respondents (43.2%) mentioned that they might have felt upset or they might not have felt upset (Neutral answer). As the data were collected during December 2020 which was the period of Corona, even it started much earlier to this month, 'hence something happened unexpectedly' means effects of Corona.

Statement 2 – It is noticed from Table-1 that 12.8 per cent respondents agreed that they felt during the last month that they were unable to control the important things of their lives. It means due to working in the Corona designated hospitals about 13 per cent respondents felt the above. On the other hand, about 38 per cent did not feel so. The table also shows that about 41 per cent have given their answer as 'Neutral'. The neutral may be treated as agreed as well as disagreed. As a matter of fact the respondents have not categorically mentioned as 'disagreed', therefore, there is no harm if the neutral answer could be treated as agreed also.

Statement 3 - Twenty seven per cent respondents agreed that they felt 'nervous' and 'stressed' during the last month. It is also noticed from Table-1 that 29.1 per cent did not feel 'stressed and nervous'.

Statement 4 – This is a negative statement, it means that percentage of those who did not agree with this statement is 18.2. It simply means such respondents did not feel confident to handle their personal problems. On the other hand, 42.6 per cent agreed to the statement. It is also observed from the table that 39.2 per cent had chosen 'neutral' as the option.

Statement 5 - This is also a negative statement and as it is mentioned above that the coding was reversed of the negative statements. The table shows that 29.1 per cent respondents did not agree to this statement, so it may be concluded that they felt during the last month that things were not going to their way, whereas 25.1 per cent felt that the things were going in their own way.

Statement 6 –It is observed from the table that 37.2 per cent respondents mentioned that they did cope up with all the things that they had to do during the last month, while 15.3 per cent were of the opinion that they could not cope up. There are also 47.3 per cent whose answer was neutral.

Statement 7 –This statement is negative and there are 29.1 per cent respondents who mentioned that they could not control irritation during the last month, and on the other hand 27.1 per cent mentioned that they were able to control irritations. The table also reveals 43.2 per cent have given their answer as neutral.

Statement 8 –This statement is also a negative one. The table indicates that 33.8 per cent respondents were of the views that they were not feeling on the top of things during the last month, and 15.5 per cent mentioned that they were feeling on the top of things during the last month.

Statement 9 – It is found from the table that 21.6 per cent respondents expressed that they felt angered because of things that were outside their control during the last month, whereas 40.5 per cent did not feel angered.

Statement 10 - The percentage of respondents is 20.9 who mentioned that they felt that difficulties were piling up so high that they could not overcome them during the last month, while 39.9 per cent did not feel so. Of course 39.1 per cent expressed their response as neutral.

Statement 11–About one third respondents (32.4%) agreed that COVID 19 pandemic has resulted in reducing the level of job satisfaction among the nursing staff. There are also 40.5 per cent, whose answer was neutral, whereas 27 per cent disagreed with thestatement.
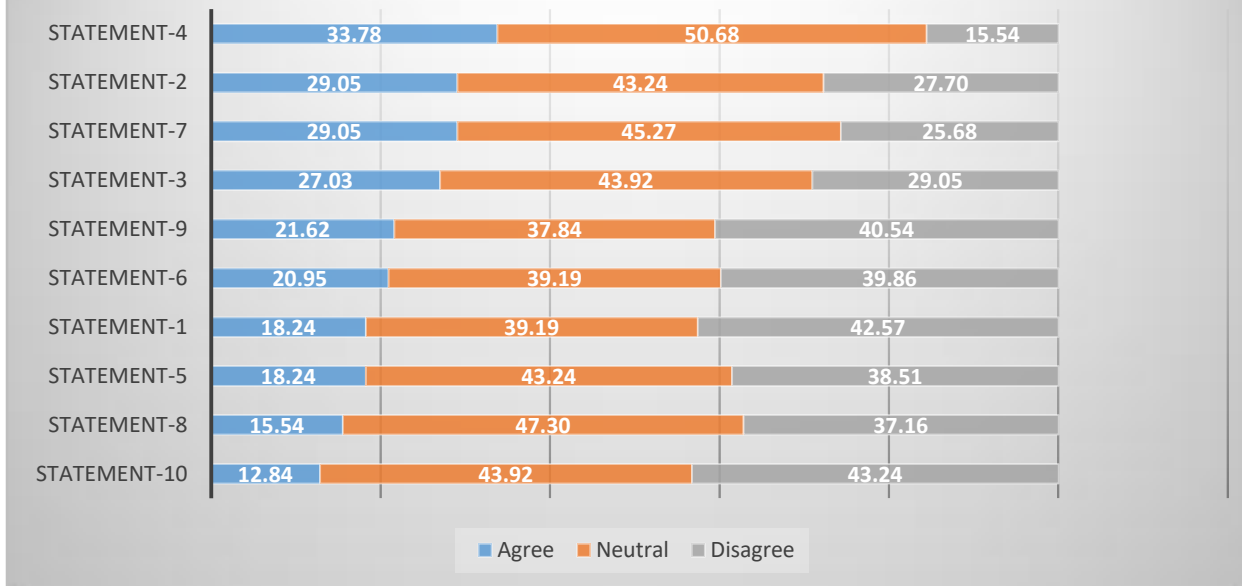
It may be **concluded** from the above interpretation that the nurse respondents did feel stress of one type or the other due to working in the COVID -19 designated hospitals. On the other hand,the respondents also felt reduction of job satisfaction due to working in the COVID -19 designated hospitals.

Table 1
Frequency distribution of stress statements (1 to 10), reduction of satisfaction statements (11) of respondents(N = 148)

Statements	Disagree	Neutral	Agree
Upset because of something that happened unexpectedlylast month	57 (38.5%)	64(43.2%)	27(18.2%)
Unable to control the important things in last month	64(43.2%)	65(43.9%)	19(12.8%)
Felt 'nervous' and 'stressed'in last month	43(29.1%)	65(43.9%)	40(27.0%)
Felt confident about ability to handle personal problems in last month	63(42.6%)	58(39.2%)	27(18.2%)
Felt things were going in one's way in last month	38(25.7%)	67(45.3%)	43(29.1%)
Not coping with all the things that one had to do in last month	55(37.2%)	70(47.3%)	23(15.5%)
Able to control irritations in one's life in last month	41(27.1%)	64(43.2%)	43(29.1%)
Felt on top of things last month	23(15.5%)	75(50.7%)	50(33.8%)
Felt angered because of things that were outside one's control during last month	60(40.5%)	56(37.8%)	32(21.6%)
Felt difficulties were piling up so high to overcome them in last month	59(39.9%)	58(39.2%)	31(20.9%)
.Covid-19 pandemic resulted in reducing the level of job satisfaction among the nursing staff.	40(27.0%)	60(40.5%)	48(32.4%)

Graphical presentation of the stressors. In the graph, only the statement numbers are mentioned, and these numbers correspond with the description given in the above table.

Stressor among the Nursing Staff

Statement	Agree	Neutral	Disagree
STATEMENT-4	33.78	50.68	15.54
STATEMENT-2	29.05	43.24	27.70
STATEMENT-7	29.05	45.27	25.68
STATEMENT-3	27.03	43.92	29.05
STATEMENT-9	21.62	37.84	40.54
STATEMENT-6	20.95	39.19	39.86
STATEMENT-1	18.24	39.19	42.57
STATEMENT-5	18.24	43.24	38.51
STATEMENT-8	15.54	47.30	37.16
STATEMENT-10	12.84	43.92	43.24

■ Agree ■ Neutral ■ Disagree

Relationship of Stress Statements with Reduction of Job Satisfaction Level

The Pearson correlation statistical tool has been applied to assess the relationship between each stress statement with the 'Reduction of job satisfaction level due to Covid-19 Pandemic'. Such correlation coefficients are presented in Table 2, and interpretation of each relationship is as follows:

Statement 1 – The value of correlation coefficient in the table indicates that the relationship is positive and significant (r = 0.189, significant at .05 level). It may mean that those respondents who have agreed that they were often feeling upset because of something that happened unexpectedly (COVID - 19) also agreed that COVID -19 pandemic caused the reduction of job satisfaction.

Statement 2 – This statement is having significant relationship with the 'Reduction of Satisfaction Level due to Covind-19' variable (r =0.198, significant at .05 level). It indicates that those respondents who often felt that they could not control the important things of their life during the last month, which of course was the COVID -19 period, also felt the reduction of satisfaction level. It may therefore be concluded that such type of stress due to Covid-19 also affected the reduction of job satisfaction level.

Statement 3 – There is a positive and significant relationship of this statement with the variable 'Reduction of job satisfaction' in COVID period (r = 0.237, significant at .01 level). This relationship reveals that the respondents who felt nervous during the COVID period also felt the reduction in job satisfaction level and vice versa. As the respondents are nurses, working in designated COVID -19 hospitals, were continuously feeling stress and this also resulted in the reduction of job satisfaction level.

Statement 4 – This is a negative statement and those who disagree with this statement are having the stress. The relationship of this statement with the variable 'Reduction of job satisfaction' is negative and significant (r = -0.309, significant at .01 level). It indicates that the respondents who do not often feel confident to handle the personal problem also feel reduction of job satisfaction. It may be concluded from the description that during the COVID -19 period, the respondents in general were not feeling confident to handle their personal problem, which resulted in reduction of job satisfaction.

Statement 5 – This statement is negative and the simple meaning of this statement is that those respondents who disagree with this statement were often not feeling that the things were going their own ways during the last month (COVID -19 period). This resulted into stress. The relationship of this variable with the 'Reduction of Job Satisfaction Level due to Covid-19' variable is negative and significant (r = -0.238, significant at .01 level). Therefore, it may be concluded from the above that the respondents who felt that the things were not going their own way due to Covid-19 also felt the reduction of job satisfaction. In other words, it may be concluded that such type of stress would also lead to reduction of job satisfaction.

Statement 6 – The table shows that correlation coefficient of two variable is not significant.

Statement 7 –It is observed from the table that there is no significant relationship between two variables.

Statement 8 – The table shows that the relationship between this statement and variable 'Reduction of Job Satisfaction level due to Covid-19' is significant and negative (r = -0.291, significant at .01 level). It may be inferred from this relationship that the respondents who did not feel on top of things during the last month (COVID -19 period) also felt the reduction of job satisfaction.

Statement 9 – The table reveals that there is no significant relationship between the two variables.

Statement 10 – There is a positive and significant relationship of this variable with 'Reduction of Job Satisfaction Level' variable (r = 0.203, significant at .05 level). It may be concluded from such relationship that the respondents who felt during the Covid-19 period that difficulties were piling up so high that they could not overcome them also felt the reduction of job satisfaction level.

It may be concluded from the above deliberations that each type of stress leads to reduction of job satisfaction during the COVID -19 period. The ten statements of stress indicate that all these 10 type of feelingsmay be the cause of stress, and relationship of each statement with the variable 'reduction of job satisfaction level' indicates that each of these may results in reduction of job satisfaction. It is further stated that out of ten statements, the seven are significantly lead to reduction of job satisfaction, whereas the remaining three stressors also lead to reduction of job satisfaction level as the correlation coefficient values are also quite high but the relationship is not significant.

Table 2
Relationship of Statements of Stress with Satisfaction ofRespondents(N = 148)

Stress statements	Reduction of Job Satisfaction Level due to Covid 19
Upset because of something that happened unexpectedly last month	0.189*
Unable to control the important things in last month	0.198*
Felt 'nervous' and 'stressed' in last month	0.237**
Felt confident about ability to handle personal problems in last month	-0.309**
Felt things were going in one's way in last month	-0.288**
Not coping with all the things that one had to do in last month	0.111
Able to control irritations in one's life in last month	-0.153
Felt on top of things last month	-0.291**
Felt angered because of things that were outside one's control during last month	0.144
Felt difficulties were piling up so high to overcome them in last month	0.203*

*Significant at 0;05 level   **Significant at 0.01level*

Discussion

The findings of the study have been discussed in detail, and it is observed that the nurse respondents are working in such hospitals which are designated as COVID -19 hospitals. The patients of COVID -19 were admitted and the nurses were directly in contact with the COVID patients. Of courses they were taking all type precautions to save themselves from getting infection. The reports in the newspapers showed that many a health care worker also became infected withCorona virus, and many of them also lost their lives. Therefore, such reports also increased the level of stress among the nursing staff. The present study attempted to identify the impact of stress on job satisfaction for the nursing staff on account of working among the COVID patients. The measuring scale is the standardized one(PSS-10) for measuring the different type of stressors, and it may be mentioned here that the scale has been used by several researchers in their studies. The analysis of data shows that the nurses experience the above ten types of stressors. The results of the study also indicate that the percentage of respondents is quite high who have experienced each of the ten stressors. On the other hand, the percentage of respondents is also high who felt the reduction of job satisfaction level due to each stress. Of course all these stressors are the result of Covid-19 virus as the percentage of patients of COVID virus was quite high during December 2020 (The data collection period of this study). Many reviewed studies have also indicated that stresses affect the job satisfaction. Some of such studies were carried out by Lee and Jung[11], Shah et al.[14], Fasbender et al.[18], Al Maqbali[19] and Karem et al.[20] (2019). These researchers have identified several factors known to have affected job satisfaction among nurses. The factors may vary from the environmental factors to personality traits of the working professionals. Some have also identified working conditions and work culture as such factors. Working environment, policies, supervision etc. are some environmental factors while compensation, degree of autonomy, job outcomes etc. are some characteristic aspects. Similarly, work culture, growth prospects, equipment etc. are some work-related factors.

Conclusion

Beside general public, the hospital staff including nursing staff also became the victims of COVID-19 pandemic which engulfed the whole world. Many of the nursing staff also lost their lives due to Corona virus. The nurses working in the specially designated COVID-19 hospitals in Delhi were experiencing a lot of stress. The researcher of the present study himself visited some hospitals during the pandemic period, and got the requisite information from 148 nurse respondents. The results of the statistical analysis of 148 sampled respondents showed that quite a high percentage of respondents showed the sign stress (measured by PSS-10 which measures stress by 10 stressors). The findings also indicated that each of the ten stressors has relationship with the reduction of job satisfaction. Each of such relationships suggests that there is a reduction of job satisfaction. Seven out of ten stressors have significant relationship with reduction of job satisfaction, whereas the remaining three have a high correlation value with the reduction of job satisfaction but the relationship is not significant.

Implication

The study appears to be very important because it identifies the stressors which are experienced by the medical and para-medical staff, working in the pandemic designated hospitals. In order to boost their level of moral, job satisfaction, overcoming the stresses, the counseling modules could be prepared for the medical and paramedical staff to boost their moral, how to overcome the stress, and create a good atmosphere and environment, working conditions, good relations among the staff of different levels. Such counseling may lower down the stress level which may lead to job satisfaction.

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Achievement of National Tuberculosis Elimination Programme by Various States in India: The Way Forward

*Nikita Singh and **V.K. Tiwari

*MPH student, Symbiosis Institute of Health Sciences, Symbiosis International (Deemed) University, Pune;
E-mail: niksingh9049@gmail.com
**Prof. and Dean of Studies, National Institute of Health and Family Welfare, Munirka, New Delhi.

Abstract

Successful control of TB worldwide depends on strengthening the TB control programmes by increasing access to rapid diagnosis and providing effective treatment. As transformation tools are developed, burdensome countries like India need to improve the efficiency of their healthcare systems and ensure better adoption of new technologies. To decline the TB numbers in India, it must be ensured that the treatment given to the TB patients is effective and result-oriented. TB elimination efforts are essential to focus on all forms of TB, together with Extra Pulmonary TB, leaving no one behind to realize the dream of ending TB. The data were collected using the World Health Organization (WHO), India TB reports from 2015-'22; and various other literatures were reviewed. Kerala and Madhya Pradesh have an excellent notification rate while Haryana and Kerala have a reasonable success rate in terms of MDR-TB and Cure Rate of Treatment Outcome of TB patients in the public sector has been increasing for the last five years and will be able to achieve elimination of TB soon.

Keywords: MDR-TB, Social Stigma, TB Elimination Goal, Health Education, TB Management.

Introduction

Tuberculosis is treatable and curable with standard antibiotic therapy but it still claims millions of lives worldwide. The 2019 World Health Organization (WHO) Global Tuberculosis Report shows that 10 million people were infected with tuberculosis in 2018, of whom 1.5 million died. WHO recommends that well-functioning tuberculosis programs achieve treatment success rates of at least 90 per cent and a cure rate of 85%. These goals will contribute to effectively reducing tuberculosis transmission at household and community levels and reducing tuberculosis-related complications and mortality.[1] Tuberculosis (TB) remains a major public health problem worldwide and is associated with social stigma in many parts of the world. Efforts to combat tuberculosis have been steadily progressing, with significant advances in diagnosis, treatment planning, and universal coverage. However, monitoring TB control's progress by measuring TB's disease burden at the national level has always been challenging. In India, childhood tuberculosis is also significantly underdiagnosed and underreported. Early detection of childhood tuberculosis cases is important for managing tuberculosis in the general population. Social determinants such as overcrowding, lack of awareness and knowledge of tuberculosis, and malnutrition need to be addressed to combat tuberculosis. There is an urgent to promote educational activities between patients and more vulnerable people about the causes of tuberculosis, infections, preventative measures, treatment durations, and dosages with the help of DOTS providers and appropriate IEC (Information Education and Communication) materials[2].

The association between poor people and TB is well-recognized, and the highest rates of TB were found in the low socioeconomic sections of the community like Bihar and Uttar Pradesh. TB occurs more frequently among low-income people living in crowded areas and persons with little schooling. Poor people living in slums may result in poor nutrition, which may be associated with alterations in immune function. On the other hand, poor people have overcrowded living conditions, poor ventilation, and poor hygiene habits increasing the risk of transmission of TB. It was also seen that they had a reduced amount of health facilities, budget utilization was less, detection rate and treatment rate were also poor. [2]

The following framework highlights the NSP's core impacts, outcome measures, and objectives, including private sector involvement and proactively identifying tuberculosis cases among key groups (socially vulnerable and at high clinical risk).[3]

Table 1
Results framework of impact indicators and targets.

Impact Indicators	Baseline		Target	
	2015	2020	2023	2025
To reduce estimated TB Incidence rate (per 100,000)	217 (112-355)	142 (76-255)	77 (49- 185)	44 (36- 158)
Outcome indicators	**Baseline**		**Target**	
Treatment success rate among notified DRTB	46%	65%	73%	75%

Source: RNTCP, NSP for TB elimination 2017, MoHFW

Table 1 highlights the areas of focus such as specific protections to prevent active Tuberculosis outbreaks and Tuberculosis in the high-risk group from achieving the National Elimination Tuberculosis Programme.

Methodology

The analysis includes India TB reports from the years 2015- 2022 on the website of the government of India website. Various studies and assessment reviews related to DR-TB, stigma in the community related to TB, and Health Services in Private Sectors of India were shown to understand different perspectives, issues, and achievements against treatment outcomes could be seen regarding health services and the success rate of TB related to treatment outcome. The data were analyzed manually using MS Excel software. Data analysis largely followed the framework approach. The answers were entered in the worksheet. Data were coded, indexed, and charted systematically to seek meaning from all available data. The major states, the most populous in India, were selected for the study so that the Notification rate, Success, and Cure Rates of Tuberculosis cases are reasonable and readily available to compare. The TB case notification rate was compared to the national strategic plan (NSP) framework, which highlights the framework of impact and outcomes of Tuberculosis cases among crucial groups.

Findings

The Notification Rate, Success Rate, and Cure Rate are essential to know about the success of the Elimination Programme in the public and private sectors. The following notification rate was analysed.

Table 2 represents total TB cases notified from the public sector with its incidence rate and the population in lakhs in the major states of India for 2016, 2017, and 2018. We can interpret from the

above table that the incidence rate of all the above states was less or more compared to the Results framework of impact indicators and targets Table 1.

Table 2
TB Cases Notified in the Year 2016-'18

States	2016		2017		2018	
	Population (in lakh)	TB patients notified from public sector (incidence rate)	Population (in lakh)	TB patients notified from public sector (incidence rate)	Population (in lakh)	TB patients notified from public sector (incidence rate)
Andhra Pradesh	511	64420 (126)	515	67074 (130)	518	65192 (126)
Bihar	1154	59020 (51)	1178	54995 (47)	1200	63642 (53)
Gujrat	656	89293 (136)	666	109422 (164)	676	106451 (157)
Haryana	277	41389 (149)	281	34104 (121)	286	50311 (176)
Karnataka	652	59732 (91)	660	69199 (104)	668	68657 (103)
Kerala	340	20969 (62)	341	14522 (42)	342	20990 (61)
Maharashtra	1193	122172 (102)	1213	124900 (103)	1227	140068 (114)
Madhya Pradesh	791	113172 (143)	804	117583 (146)	817	120771 (148)
Rajasthan	749	90032 (120)	761	84774 (111)	774	113972 (147)
Tamil Nadu	771	82107 (106)	783	74256 (95)	793	75415 (95)
Uttar Pradesh	2178	260572 (120)	2215	244074 (110)	2251	305626 (136)

Source: India TB report of 2017, 2018 and 2019

The figures in Table 2 reveal that there was relatively a lower incidence rate in Kerala in all the three years, and Bihar had also significantly a lower incidence rate due to a poor health system and a significant shortage of staff at the ground level. That is why effective health talks, education, and preventive measures need to be addressed to the community to reduce the transmission of the disease. Even then, if there is a person in the community who is having any symptoms of TB, it goes to the health sector and does tests and if found positive immediately starts his/her medications so that the case notification rate also improves, and we will be able to achieve the target as soon as possible.

Patients stop taking treatment after someday and they develop MDR-TB, so to count the success rate of MDR-TB was analyzed state-wise.Table 3 describes India's Multidrug-resistant TB Success Rate, significant state-wise data from 2016-19 in percentage form, and progress seen in the last five years.

Table 3
MDR-TB Success Rate in India State Wise Data from 2016-19

States	Success rate of MDR-TB			
	2016	**2017**	**2018**	**2019**
Andhra Pradesh	47%	48%	53%	62%
Bihar	56%	56%	50%	52%
Gujrat	43%	42%	47%	56%
Haryana	50%	55%	62%	65%
Karnataka	45%	47%	47%	57%
Kerala	58%	61%	60%	67%
Maharashtra	36%	38%	50%	52%
Madhya Pradesh	45%	50%	55%	59%
Rajasthan	47%	46%	50%	56%
Tamil nadu	43%	39%	46%	55%
Uttar Pradesh	47%	50%	52%	56%

Source: India TB report of 2017, 2018 ,2019 and 2020.

From table 3, we can conclude that MDR-TB Success Rate was highest in Kerala in all four years, and in the year 2016-17 lowest in Maharashtra soon significantly improved after that. In 2016-17, there was not much of a success rate, but compared to other years, it has improved a lot in the last four years. We can see in the year 2019 that all the states have a success rate and but we are far behind from achieving the elimination of the TB target. Table 4 represents the cure rate for treatment outcomes of TB patients reported in the public sector in the major states of India. It was seen that in most of the states, there was a gradual decrease in the cure rate from 2015 to 2020.

Table 4
Cure Rate for Treatment Outcome of TB Patients in Public Sector State Wise Data.

States	Cure Rate					
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Andhra Pradesh	89%	84%	78%	72%	75%	79%
Bihar	77%	58%	49%	63%	60%	46%
Gujrat	88%	86%	67%	76%	78%	85%
Haryana	86%	71%	64%	73%	66%	60%
Karnataka	84%	77%	62%	69%	69%	73%
Kerala	85%	79%	75%	82%	75%	71%
Maharashtra	82%	76%	63%	69%	67%	69%
Madhya Pradesh	87%	76%	68%	72%	61%	62%
Rajasthan	88%	86%	71%	67%	62%	66%
Tamil nadu	83%	72%	68%	75%	73%	74%
Uttar Pradesh	82%	58%	50%	65%	59%	59%

Source: India TB report of 2016,2017, 2018 ,2019 and 2020.

From table 4, we can conclude that the cure rate for treatment outcomes of TB patients in the public sector was highest in Gujrat and Andhra Pradesh. In addition lowest was in Bihar and Uttar Pradesh. Gujrat is only the state with an 85 per cent cure rate in 2020.

Figure 1 shows the financial performance of the National Tuberculosis Elimination Program from the year 2016-22. This figure shows Budget Requested by the states, Budgets Approved after those Total Releases to states and at last, it shows total expenditure in crores.

Figure1

Year-wise Data of Financial Performance of NTEP
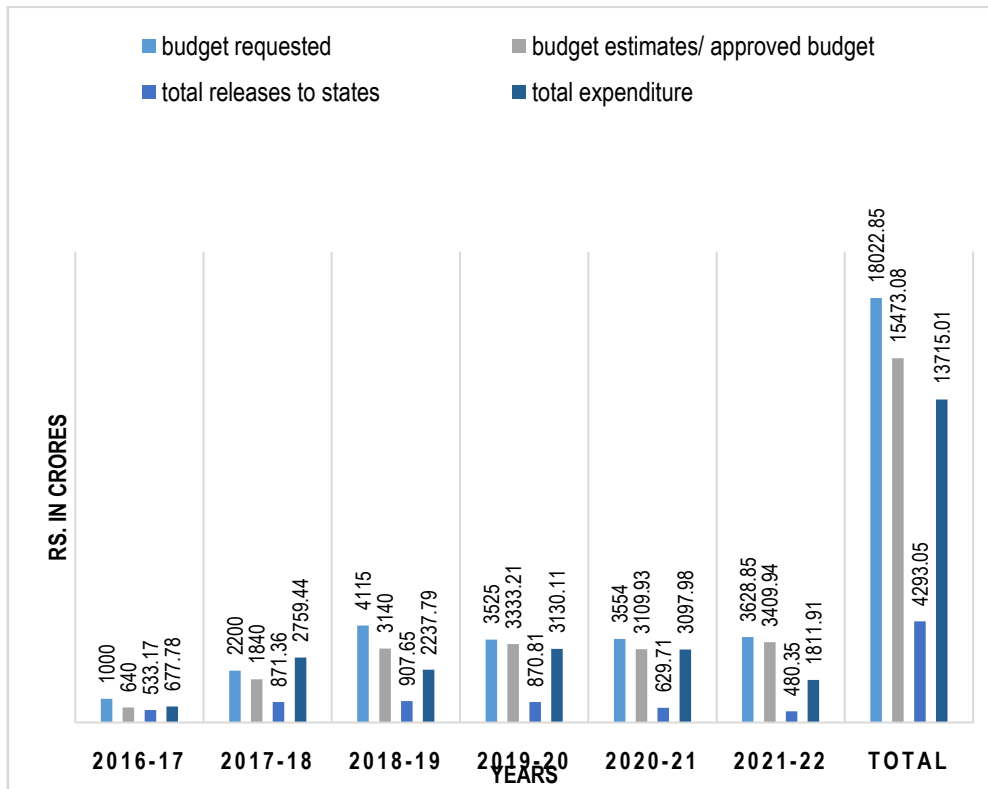
Source- TB Annual Report 2022

It could be seen from the above graph that budget requested for the year 2021-'22 was the highest while the approved budget was a little lesser than the amount that was sought but the amounts released to the states were the lowest in all the years from 2016-2022 for the performance of National Tuberculosis Elimination Programme. By dividing the total released amounts to the states by the budget request;it is observed that in the year 2016-'17, it was 53.3 per cent; in 2017-18, it was 39.59 per cent;in 2018-1'9, it was 22 per cent; in 2019-'20, it was 24 per cent;in 2020-'21 it was 17.6 per cent and in 2021-'22 it was 13 per cent. The total financial performance of NTEP from 2016-22 was 23.8 per cent.

Discussion

The vast majority of tuberculosis patients in resource-poor environments are affected by food insecurity, affecting treatment compliance and outcomes. Analysis of the data shows that the burden of TB is higher in the states with poor socio-economic conditions. These states are Uttar Pradesh and Bihar. Many states in the southern parts of the country are closer to the TB elimination target by 2024 while other poor-performing states may achieve the target beyond the target date. Low achievement is primarily due to low utilization of budgets and poor facilities for TB diagnosis and treatment. Lack of professional HR and poor network of healthcare facilities working at peripheral levels. The efforts to educate the community on preventing TB spread and risk factors are also not up to the mark. The budget requested by the states is very high, and total releases to the states are low. The government of India should make provisions so that full releases to the states are equal to the budget requested, or there will be differences, and states will not be able to eliminate TB in time.

Biswas B et al. observed in their study that there was a significant shortage of ground staff and low overall treatment success rates. In order to improve the performance of NTEP in Bihar, rigorous monitoring and evaluation should be carried out at each stage of program implementation.[10] Thakur, G. et al., in their study of Status and challenges for tuberculosis control in India, Stakeholders understood in their paper that universal access to healthcare and efficient treatment of multidrug-resistant tuberculosis could significantly reduce the spread of tuberculosis.[11] Malaisamy et al. have observed in their paper 'Estimating TB diagnostic costs incurred under the National Tuberculosis Elimination Programme: a costing study from Tamil Nadu, South India' that the NTEP is funded by the Government of India and global healthcare providers to ensure free and continuous provision of diagnostic and therapeutic services. The delivery of tuberculosis care services requires significant and sustained financial resources to provide and maintain standards of tuberculosis care services. This has resulted in significant resource investment and budget implications for the government.[12]Pai M. et al., in their studies of TB control challenges and opportunities for India, mentioned that India is not on target to meet the End TB Strategy goals. But with high-level leadership, political commitment, active engagement of both public and private sectors, and active civil society and community support, India could blaze the trail for other high-burden countries to emulate and demonstrate that it is indeed possible to end the TB epidemic.[13]

Bhargava et al. studied social determinants of tuberculosis and explained that the TB elimination strategy in India needs a pro-poor model of patient-centered care inclusive of nutritional, psycho-social, and financial support, universal health coverage, and social protection; and convergence with multi-sectoral efforts to address poverty, undernutrition, unsafe housing, and indoor pollution.[14]

In their study about the financial burden on tuberculosis patients in low-and middle-income countries, Tanimura T et al. in the year 2014 did a systematic review in which they concluded that loss of income is often the most significant economic risk for patients. Apart from ensuring that health services are funded equitably and delivered to minimize direct and indirect costs, tuberculosis patients and affected family members need adequate income.[15] In Kerala, there are still relatively low load settings that can offer opportunities to move towards elimination. Kerala's End TB Strategy is based on Kerala Tuberculosis Sustainable development goals and is a regional version of the Global End TB Strategy and the Tuberculosis elimination approach. It talks about ways to accelerate effects to End TB and move forward towards elimination.[16]

Conclusion and Recommendations

Every person in the country should be educated about tuberculosis, and all of them in the population should be included so that the TB Notification Rate could be achieved adequately in addition to Success Rate. But it is believed that the poor and marginalized segments of society deserve special attention, as seen in Uttar Pradesh and Bihar, because these groups survive in poor and overcrowded living conditions and have high malnutrition rates. Using the local language to advertise the campaign will help us reach the most remote areas in India. Universal access to health care and efficient treatment of multidrug-resistant tuberculosis can significantly reduce the prevalence of tuberculosis. Improving general health care, improving living standards, and proper nutrition are several ways to combat this deadly illness. Access to free or cheap medicines and treatments, faster and more accurate diagnostic techniques, and the private sector managing TB programs will help improve existing infrastructure and medical services. Diabetes and heart disease are common causes of death in tuberculosis patients, so finding nearby homes where residents may be more susceptible to contracting tuberculosis requires trained health care workers. It is essential to go door-to-door for awareness and televising. There must be an IEC activity that should have been information gathering to

improve cure rates in Bihar, Madhya Pradesh, Andhra Pradesh, and Uttar Pradesh and could not be done in all private as well as public sectors.

The Way Forward

Measures to strengthen existing government initiatives include: The Indian government must declare tuberculosis a health emergency and campaign to fight it, minimize stigma, counselling should be done, Engage various stakeholders, especially elected officials and civil society, establish cross-sectoral coordination, Empower and engage the TB community, TB patients should not be seen as passive patients receiving treatment, but should be key stakeholders at all stages of planning, decision-making, implementation, and monitoring.

Limitations of Study: The limitations of this study include the secondary data published in the report as well as studies which were available on PubMed, Web of Science and no feedback could be taken from the State or District Programme Managers / Nodal TB officers and TB patients who were attending government TB hospitals.

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Family Planning Differentials by Religion in India

*Dewaram A. Nagdeve and **Prashant B. Dongardive

* Professor, Department of Fertility and Social Demography, E-mail: dnagdeve@iipsindia.ac.in;
**Research Scholar, International Institute for Population Sciences, Deonar, Mumbai 400 088, India.

Abstract

This paper examines the family planning differentials by religion in India. The data from the National Family Health Survey (NFHS 4) conducted during 2015-2016 in India have been analysed. The analysis of data has been done by using bi-variate and multivariate analyses to observe the association between each of the dependent and independent variables. The current use of family planning differentials exists by religion. Jains have exhibited the highest use of family planning as compared to Hindus, Christians, Sikhs, and Buddhists/Neo-Buddhists while it is the lowest for the Muslims. The family planning differentials by religion exist even after controlling the effects of major indicators of socio-economic development. The effects of socio-economic status may vary according to the religious context. Multivariate analysis on use of family planning show that differentials in use of family planning by religionexist even after controlling for the other socioeconomic and demographic variables.

Keywords: Hindu, Muslim, Religion, Family planning, Differentials, India.

Introduction

The national family welfare programme in India has experienced significant changes in terms of policy since its inception in 1951. Several issues continue to affect the program and many goals remain under-achieved. Religion continues to play an important role in use of family planning differentials in India. The lower contraceptive use rates and higher fertility rates among Muslims than among Hindus and people of "other" religions has well documented in India.[1-3]The use of family planning vary from one religion to other religion according to the socio-economic development,[4-6] while others argue that it is due topronatalist ideology and greater opposition to family planning among Muslims.[2,7,8]The acceptance of contraceptive methods still varies among different castes and religious groups in India.The socioeconomic factors and cultural milieu of Indian society responsible for such variation operate at the individual, family, and community level.[9]The researcher reviewing the socio-economic and demographic data according to religion available from various sources concluded that the differences in family planning acceptance of the Hindus and the Muslims are marginal[10].Kirk (1967) argued that Islam has been a more effective barrier to the diffusion of family planning than other religions[11].

Previous studies show that Muslim women in India had a lower use of family-planning services than Hindu women and women from other religious groups[4,7,12-14].The contraceptive prevalence rates were the highest (48-63%) among the women of Jains, Buddhists, Sikhs, and Christians (minority religious groups), followed by Hindus (42%) and 28 percent for Muslims.[15] The prevalence of sterilization among Muslimwomen was low at 14 percent compared to 29 percent for Hinduwomen and 30-35 percent for women from other religiousgroups. The use of modern temporary methods wasslightly higher among Muslim women (6%) than amongHindu women (5%), although women from other religiousgroups had the highest levels (17-22%) of theuse of temporary modern methods.The religious differentials in the adoption of family planning services have shown to exist after controllingfor socioeconomic and demographic factors[16].The official family planning programmes began during the 1960s adopted

a"cafeteria approach," whereby clients are provided with a choice of contraceptive methods. However, it has well documented that, until recently, the emphasis of the program remained skewed towards promoting non-reversible methods, particularly female sterilization. Hence, not surprisingly, female sterilization continues to be used by the majority of contraceptive users in India. Nationally, data from NFHS–3 show that female sterilization accounted for two thirds of contraceptive use and 77 per cent of modern method use.[17]

The major religious groups in India are Hindu, Muslim, Christian, Sikh, Buddhist and Jain. Hindus accounted for 83.4 percent of the total population in 1961 declined to 79.8 percent in 2011. The proportion of Muslim population has increased from 10.7 percent in 1961 to 14.2 percent in 2011. However, the Christian, Sikh and Jain population has decreased from 2.4 percent, 1.8 percent, and 0.5 percent in 1961 to 2.3 percent, 1.72 percent, and 0.37 percent in 2011 respectively, while Buddhist population accounts 0.7 percent of the total population in 1961 and 2011. Most of the studies have undertaken on Hindus and Muslims of India as the changes in the reproductive behaviour of these two religions will influence the demographic as well as the political scenario of the country but there are few studies on family planning differentials among religious groups in India. Therefore, in this paper, an attempt has made to study family planning differentials among religious groups in India

Methodology

The data for analysis have been drawn from the National Family Health Survey (NFHS), which is an ongoing socio-demographic health survey conducted by International Institute for Population Sciences, Mumbai. NFHS is a large-scale multi-round survey in a representative sample of households throughout India. It provides national and state information on fertility, family planning, reproductive and child health along with other socio-economic characteristics. The individual consents and all the ethical protocols have obtained before seeking a response to a set of questions on the use of family planning. For studying family planning differentials, individual and household-level background characteristics have used among religious groups in India. The details of the study design as well as the sampling frame and sample implementation have provided in the NFHS report.[18] Data collection from a total representative sample of 628,900 households and 723,875 eligible women aged 15-49 years has conducted in two phases from 20 January 2015 to 4 December 2016. The eligible women's response rate was 96.7 percent and household response rate was 97.6 percent. Out of 723,875 eligible women, 499,627 currently married women and 699,686 ever-married women interviewed. The NFHS-4 data provides information on religion and most of the women belonged to one of the seven religion, namely, Hindu, Muslim, Christian, Sikh, Buddhist and Jain, and those who are neither Hindu, Muslim, Christian, Sikh, Buddhist/Neo-Buddhist, nor Jain, and are designated as "other religions". The analysis is restricted to 499,627 currently married women who were currently using any method of family planning. Out of 499,627 currently married women who were currently using any method of family planning, 379,442 are Hindu, 63,866 are Muslim, 32,847 are Christian, 10,847 are Sikh, 6,083 are Buddhist/Neo-Buddhist, 738 are Jain and 5,804 belongs to other religions. These seven religions have considered for further analysis.The analysis of data has carried out by using bivariate and logistic regression analysis to observe the association between each of the dependent and independent variables.

Findings

Knowledge of Family Planning Methods by Religion

The knowledge of various contraceptive methods is necessary for use of contraceptive methods among couples. Table 1 presents the percentage of currently married women who know any family planning method by specific method and religion in India. It has revealed from the table that the knowledge of any family planning method including any modern family planning method is universal and it does not

vary much among religious groups in India. Female sterilization has very well-known method followed by pill, IUD, male sterilization, condom, and injectable among all the religions. Ninety-eight percent of currently married women are aware of female sterilization and 85 percent knew male sterilization. There is no much difference in knowledge of female sterilization among all the religions but the knowledge of male sterilization varies from the lowest 78 percent among Christians followed by 82 percent among Muslims to the highest 93 percent among Jains.

Table 1
Percentage of currently married women who know any family planning method by specific method and religion in India, 2015-16

Methods	Hindu	Muslim	Christian	Sikh	Buddhist/ Neo- Buddhist	Jain	Other religion	Total
Any method	99.0	98.9	98.9	99.9	99.4	99.4	97.5	99.0
Any modern method	99.0	98.8	98.8	99.9	99.4	99.4	97.4	98.9
Female sterilization	97.9	96.9	94.8	99.6	98.4	98.9	95.0	97.7
Male sterilization	85.1	82.2	78.2	94.0	87.0	92.9	75.4	84.6
Pill	87.8	90.3	84.4	97.9	90.2	96.2	87.2	88.2
IUD	76.3	77.3	72.3	96.6	84.3	91.5	64.2	76.7
Injectables	73.4	75.2	64.0	73.0	73.2	87.1	65.9	73.4
Condom	81.4	85.0	80.6	98.3	87.2	92.9	76.3	82.2
Any traditional method	64.9	67.3	59.3	93.9	55.5	69.7	64.9	65.5
Rhythm/periodic abstinence	54.8	54.9	47.5	87.1	43.6	60.1	55.1	55.1
Withdrawal	52.1	56.1	51.7	81.7	40.9	55.0	56.1	52.9
Total number of women	379842	63886	32847	10847	6083	738	5804	499627

The knowledge of spacing methods such as Pills, Condom, IUD, and injectablesare varying among religionsin India. The best-known spacing methods are Pills (88 %), condom (82 %), IUD (77 %), and injections (73 %). There is a large differential in the knowledge of spacing methods by religion in India. Eighty-one percent of women each among Hindu and Christian, 85 percent of women among Muslim as compare to 98 percent of women forSikh and 93 percent of women among Jain know Condoms. The knowledge of modern spacing methods such as Pills and IUDs are the lowest 84 percent and 72 percent among Christian women and the highest 98 percent and 96 percent among Sikh women respectively. The knowledge of all the spacing methods remains low as compared to the knowledge of female sterilization among all the religions in India. Sixty-five percent of women in India are aware of traditional methods including withdrawal method, contraceptive herbs, rhythm/periodic abstinence, and other contraceptives of Indian system of medicine.The knowledge of any traditional method is the highest 94 percent among Sikh women and it is lowest 56 percent among Buddhist/Neo-Buddhist women.

Current Use of Family Planning Methods by Religion

Table 2 shows the use of any family planning method among currently married women by religion in India. Fifty-four percent of currently married women are currently using any family planning method in India. The use of any family planning method is the highest 62 percent among women of Jain as compared to the lowest 45 percent among women of Muslim, followed by 54 percent of women of Hindu.

Table 2

Percentage of Currently Married Women Using any Family Planning Method by Religion in India, 2015-16

Methods	Hindu	Muslim	Christian	Sikh	Buddhist/ Neo- Buddhist	Jain	Other religion	Total
Any method	54.4	45.2	51.2	73.9	67.7	61.9	41.9	53.5
Any modern method	48.9	37.9	47.9	65.4	65.4	57.6	36.5	47.8
Female sterilization	38.2	20.8	40.2	38.2	52.0	38.2	14.9	35.9
Male sterilization	0.3	0.1	0.2	0.6	0.6	1.33	0.2	0.3
Pill	3.4	8.0	3.2	2.4	3.42	1.5	16.8	4.1
IUD	1.4	1.4	1.7	6.6	1.6	3.2	1.6	1.5
Injectables	0.3	0.6	0.3	0.6	0.8	0.2	0.4	0.4
Condom	5.2	5.6	2.4	17.3	7.5	5.6	2.8	5.6
Any traditional method	5.6	7.3	3.3	8.5	2.3	4.4	5.4	5.8
Rhythm/periodic abstinence	3.5	4.1	1.5	5.6	0.8	2.0	4.2	3.5
Withdrawal	2.1	3.3	1.8	2.92	1.5	2.3	1.2	2.3
Total number of women	**379442**	**63866**	**32847**	**10847**	**6,083**	**738**	**5804**	**499627**

The use of any modern methods of family planning among currently married women is 48 percent in India. This proportion is varies from the lowest 38 percent of women among Muslim, 48 percent of women among Christian, 49 percent of women of Hindu to the highest 65 percent of women each among Sikh and Buddhist/Neo-Buddhist women. Female sterilization is the most widely used method followed by a condom, IUD/Loop/Copper T, and pills among all the religious groups in India. Nearly 36 percent of currently married women and less than 1 percent of men has sterilized in India.For the users of sterilization methods by religion, female sterilization (52 percent) is most prefer family planning method among Buddhist/Neo-Buddhist women, followed by 40 percent among women of Christian and the lowest 21 percent of women among Muslim but it is not the case for male sterilization.Male sterilization is less than 1 percent in India and there is no much variation by religion but it is the lowest 0.1 percent among Muslim women and the highest 1.33 percent among Jain women. The current use of spacing methods such as condom, Pill, and IUD/Loop/Copper T varies and there are differentials by religion in India. The more used spacing methods are Condom (6 percent), Pill (4 percent), and IUD/Loop/Copper T (2 percent). There are differentials in the current use of spacing methods by religion in India. The modern spacing methods, Pills, Condoms, and IUD/Loop/Copper T are used by 8, 6, and 1 percent of women among Muslim; 3, 5 and 1 percent of women among Muslim while the corresponding figures for women of Jain are 2, 6 and 3 percent respectively. Overall, the use of temporary spacing methods is the highest among Muslim but the use of IUD is the highest among Jain as compared to other religions. The use of spacing methods remains low as compared to female sterilization among all the religions. Only six percent of women are using traditional methods, varying from the lowest 2 percent of women among Buddhist/Neo-Buddhist to 7 percent of women among Muslim,and to the highest 9 percent of women among Sikh.

Current use of Any Modern Family Planning Method by Socio-economic Characteristics of Women and Religion

The percentage of currently married women using any modern family planning methods by socio-economic characteristics of women and religions in India has given in Table 3. Forty-eight percent of currently married women in India are using modern family planning methods.

Table 3
Percentage of Currently Married Women Using Any Modern Family Planning Methods by Socio-Economic and Demographic Characteristics of Women and Religion in India, 2015-16

Characteristics	Hindu	Muslim	Christian	Sikh	Buddhist/ Neo-Buddhist	Jain	Other religion	Total	Currently married women
Age Group									
15-19	8.9	13.4	10.5	21.9	12.2	100.0	22.8	9.9	16,864
20-29	34.1	29.8	33.8	50.9	46.1	40.9	33.1	33.9	177223
30-39	59.2	47.6	55.1	72.5	77.1	66.8	47.4	57.9	173590
40 and above	60.5	42.6	55.5	73.0	82.6	60.1	32.7	58.6	131950
Age at the consummation of the marriage									
<18	54.2	41.5	58.9	72.9	74.8	63.4	43.2	52.7	209528
18 and above	44.5	34.8	43.2	63.8	59.3	56.1	28.5	43.8	290087
Marital duration									
<5	16.4	17.1	15.1	36.7	24.2	20.3	20.6	16.9	96113
5-9	40.8	35.0	41.9	62.8	56.9	53.9	31.4	40.5	90790
10-14	56.6	46.3	57.6	74.6	70.7	65.2	46.5	55.6	83169
15 and above	61.9	46.1	59.9	74.9	83.8	65.5	43.5	60.3	229555
Residence									
Urban	47.1	34.0	46.3	66.7	64.1	55.7	35.6	46.0	360349
Rural	52.7	42.8	50.6	62.5	66.9	58.1	40.9	51.2	139278
Women's education									
Illiterate	51.2	33.9	56.9	78.2	77.0	49.2	30.9	49.0	172686
Primary	54.3	42.4	49.4	67.2	73.9	73.4	50.5	52.7	72881
Secondary	47.3	40.3	47.6	62.6	59.4	65.6	36.7	46.8	209380
Higher Secondary and above	40.5	35.2	37.8	53.3	66.5	45.1	23.1	40.4	44680
Household wealth index									
Low	41.7	31.3	39.6	59.8	62.4	45.7	32.5	40.4	185623
Medium	51.9	39.9	52.3	70.2	65.2	54.6	49.3	50.6	165720
High	53.5	42.6	48.6	64.4	67.5	58.2	37.2	52.4	148284
Total	**48.9**	**37.9**	**47.9**	**65.4**	**65.4**	**57.6**	**36.5**	**47.7**	**499627**

The current use of modern family planning methods is the highest 65 percent each among the women of Sikh and Buddhist/Neo-Buddhist, followed by 58 percent of the women among Jain as compared to the lowest 38 percent of the women among Muslim. The use of modern family planning methods by age group among currently married women in the 15-19 years age group is 10 percent and this attains a peak at 59 percent in the older age group 40 and above. Similar age patterns of contraceptive use have also found among women of all the religions except Muslim and Jain. The use of any modern family planning methods among currently married women by age at first intercourse of less than 18 years is higher 53 percent than to 44 percent for 18 years and above respectively. The use of any modern family planning methods is the highest 75 percent among the women of Buddhist/Neo-Buddhist in case of less than 18 years age at the consummation of marriage. However, it is the highest 64 percent among the women of Sikh for more than 18 years of age at the consummation of marriage. On contrary, it is the lowest 42 percent and 35 percent of Muslim women respectively. The use of any modern family planning methods increases by marital duration among all the religions. The use of any modern family planning methods is higher 51 percent in urban areas as compared to 46 percent in rural areas. It is the highest 67 percent and 63 percent among Sikh women than the lowest 34 percent and 43 percent among Muslim women in urban and rural areas respectively. The use of any modern family

planning methods is the highest among the women who have primary education (53 %) than the secondary educated women (47 %) and least among higher secondary and above educated women (40 %). It indicates that it is lowest among educated groups as compared to women who have primary schooling and illiterate. Almost similar picture has observed in the current use of any modern family planning methods among all the religions. The prevalence rate of current contraceptive use of any modern family planning methods increasing for the household wealth index. It increased from the lowest 40 percent to women belonging to household of low wealth index to 51 percent for women belonging to the household of medium wealth index as compared to the highest 53 percent for women belonging to household of high wealth index. It has found that the current use of any modern family planning methods is the highest 62 percent among Buddhist/Neo-Buddhist women than the lowest 31 percent among Muslim women in case of women belonging to the household of low wealth index. In case of women, belonging to the household of medium and high wealth index, it has further found that the current use of any modern family planning methods is the highest 70 percent and 64 percent among Sikh women as compared to the lowest 40 percent and 43 percent among Muslim women respectively.

The examination of the influence of socio-economic and demographic characteristics on the current use of any modern family planning method by religion in India has carried out through the logistic regression analysis and results has depicted in Table 4. The analysis revealed that the use of any modern family planning method significantly increases among women of older age groups than among women in the age group 15-19 among all the religions in India. The likelihood of the use of any modern family planning method decreases in case of age at first intercourse above 18 years. The likelihood of the use of any modern family planning method in case of marital duration significantly increases as marital duration increases among all the religions but the more increase noticed among the women of Christian, Sikh, Buddhist/Neo-Buddhist than Muslim and Hindu women. The possibility of use of any modern family planning method in urban areas decreases among Sikh women whereas it increases among women of all other religions in India. The likelihood of use of any modern family planning method is highest among illiterate women and decreases with increasing education. Almost similar pattern for use of any modern family planning method has found among women of all the religions except Muslim, and Christian and Buddhist/Neo-Buddhist women in India. The probability of the use of any modern family planning method decreases with increasing household family wealth index among women of all the religions except Hindu, Christian, and Sikh women in India.

Desire for More Children by Religion in India

In order to obtain information on fertility preferences, NFHS-4 asked non-sterilized, currently married, non-pregnant women: 'Would you like to have (a/another) child or would you prefer not to have any (more) children?' Pregnant women were asked, 'After the child you are expecting now, would you like to have another child or would you prefer not to have any more children?' Women who expressed a desire for additional children were asked how long they would like to wait before the birth of their next child. The percent distribution of currently married women by a desire for children and religion in India has presented in Table 5. Thirty-two percent of currently married women say that they do not want any more children.This varies from the highest 41 percent for Muslim women, followed by 31 percent for Hindu women to the lowest 23 percent each for Buddhist/Neo-Buddhist and Jain women. An additional 36 percent cannot

Table 4
Results of Logistic Regression (Odds Ratio) for Current Use of Any Modern Family Planning Method by Socio-Economic And Demographic Characteristics of Women In India, 2015-'16

Characteristics	Hindu	Muslim	Christian	Sikh	Buddhist/ Neo-Buddhist	Other Religion	Total
Age Group							
15-19®							
20-29	2.403***	1.534***	2.179***	2.198***	3.066***	1.088	2.177***
30-39	2.920***	1.846***	2.040***	2.261***	4.606***	1.136	2.633***
40 and above	2.556***	1.444***	1.452	1.701*	4.097***	0.553	2.270***
Age at the consummation of the marriage							
<18®							
18 and above	0.878***	0.874***	0.684***	0.945	0.683***	0.711***	0.881***
Marital Duration							
<5®							
5-9	3.014***	2.473***	3.737***	2.728***	3.485***	1.629***	2.940***
10-14	5.253***	3.860***	7.181***	4.593***	5.301***	3.060***	5.046***
15 and above	6.475***	4.251***	8.684***	5.045***	10.064***	3.911***	6.165***
Residence							
Rural®							
Urban	1.007	1.230***	1.166***	0.857***	1.033	0.968	0.982*
Women's education							
Illiterate®							
Primary Complete	1.221***	1.560***	0.713***	0.969***	0.969	2.094***	1.259***
Secondary Complete	1.076***	1.656***	0.756***	0.920***	0.920	1.466***	1.158***
Higher Secondary and above	0.916***	1.546***	0.587***	1.818***	1.818***	0.928	1.008
Household wealth index							
Low®							
Medium	1.634***	1.296***	1.897***	1.248***	1.248**	2.040	1.604***
High	1.797***	1.271***	2.003***	1.194***	1.194	1.288***	1.762***

Note: Dependent Variable: 0- Don't use modern family planning method 1- Use a modern family planning method
Level of significance ***=P<0.001,**=P<0.05 and *=P<0.1

Table 5
PercentageDistribution of Currently Married Women by Desire for More Children and Religion in India

Desire for children	Hindu	Muslim	Christian	Sikh	Buddhist/ Neo-Buddhist	Jain	Other religion	Total	Currently married women
Want another soon	11.9	14.2	12.4	10.1	10.8	10.8	13.4	12.2	61098
Want another later	10.3	13.6	9.1	10.1	8.9	8.9	18.1	10.8	55846
Want another, undecided when	0.8	1.4	1.7	0.3	0.6	0.6	1.2	0.9	6157
Undecided	2.5	3.9	5.8	2.0	1.9	1.9	5.4	2.7	20174
Want no more	30.6	41.0	24.5	35.3	23.1	23.1	42.5	31.9	169602
Sterilized	38.5	20.9	40.5	38.9	52.6	52.6	15.1	36.3	159361
Declared infecund	5.3	5.1	6.1	3.4	2.1	2.1	4.3	5.2	27325
Never had sex	0.0	0.0	0.1	10.1	10.8	10.8	0.0	0.0	63
Total number of women	**379442**	**63866**	**32847**	**10847**	**6083**	**738**	**5804**	**379442**	**499627**

have another child because either the wife or the husband has been sterilized, varying from the lowest 21 percent among Muslim women to the highest 53 percent each for Buddhist/Neo-Buddhist and Jain women. Three percent say that they cannot get pregnant (that is, they are 'declared infecund'). This varies from the lowest 2 percent each for Buddhist/Neo-Buddhist and Jain women to the highest 6 percent for Christian women. Twelve percent of women say they would like to have another child soon. This proportion is the lowest 10 percent for Sikh women and the highest 14 percent for Muslim women. Eleven percent of women say they would like to have another child later and this varies from the lowest 9 percent each for Buddhist/Neo-Buddhist and Jain women to the highest 14 percent for Muslim women. Only 3 percent of women undecided and 1 percent want another but undecided when to have child and there are no much variation among religious groups in India.

Discussion

This paper has examined the family planning differentials by religion in the context of socio-economic and demographic characteristics in India. The analysis reveals that family planning differentials exist by religion and Muslims have exhibited low family planning use as compared to Hindus, Christians, Sikhs, and Buddhists/Neo-Buddhists while it is highest for Jainsin India.An analysis of fourth National Family Health Survey shows differentials in family planning use by religion are substantial in India. A similar to our study[19]shows that significantly lower use of family planning among Muslims is not due to their differential socioeconomic status.Again, the fact that controlling for socioeconomic factors almost completely accounts for differences in contraceptive use rates between Hindus and women of other religions suggests that the controls are adequately capturing socioeconomic conditions that influence contraceptive acceptance in India.The results also indicate that contraceptive prevalence is rising for all religions, including Muslims, but the difference between Muslim and non-Muslim contraceptive use rates remains large and statistically significant.In contrast to our study[20] based on their study conducted among ever married women residing in the field practice areas of Department of Community Medicine, Jawaharlal Nehru Medical College, Aligarh, Uttar Pradesh concluded that current use of contraceptives was almost similar among Hindus and Muslims, though significant differences existed for ever-use of contraceptives among them.

Conclusion

The differentials in current use of family planning exist by religion; Muslims have exhibited lowestuse of family planning while it is highest for Jains.The differential in current use of family planning has found to be significantin case of older women, marital duration, and household wealth index. However, the influence of women education on the relationship between current use of family planning and religion was not significant and the influence of these factors on such differentials, if any, was not large. Hence, it is difficult to conclude that differential in family planninghas due to religion alone, unless the other variables, which are likely to influence use of family planning, hassimultaneously controlled through MCA or other multivariate analysis. Nevertheless, a partial explanation for the observed differential in use of family planning appears to be the unequal acceptance of family planning methods by different religions. The analysis shows that socioeconomic factors do not explain lower use of family planning among Muslims.

Recommendations

The household wealth index has contributed to narrow use of family planning differentials by religion although it exists in India. The logistic regression analyses of method use found that the older women and less educated women are much more likely to use any modern method of family planning among

all the religions in India. Therefore, there is a need to focus on younger and educated women through motivation programmes.

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