Public Health Perspectives: Unveiling the Socio-Demographic Tapestry and Nutritional Wellness of *Khatik* Women in North-East Delhi

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Abstract

Introduction: The dietary intake pattern significantly impacts human health. Malnutrition remains a critical global issue, requiring comprehensive and on-going intervention efforts. Approximately one-third of the world's population faces some form of malnutrition, including underweight, overweight, or obesity. Proper nutrition is essential for individual health, particularly among women, emphasizing the importance of addressing nutritional needs effectively. This study investigates the relationship between nutritional status and socio-demographic/reproductive profiles of *Khatik* women in North East Delhi. **Material and Methods**: A cross-sectional investigation was carried out within the *Khatik* community of North East Delhi, involving data collection from 400 respondents. The current study examined the nutritional status using Body Mass Index (BMI) as a primary health indicator. **Results:** Results from the analysis indicated notable variations across BMI categories concerning age and reproductive variables. Specifically, as the age of the respondents increased, there was a greater likelihood of being overweight or obese. According to the study findings, overweight/obese women demonstrated a higher median (Median 21 IQR-19-22) consumption of full meals compared to both normal (Median 21, IQR-18-22) and underweight (Median 19, IQR-17-24) women. Similarly, underweight individuals (Median 3, IQR-2-5) exhibited a lower median intake of milk products compared to both normal weight (Median 4, IQR-3-6) and overweight (Median 4, IQR-3-6) respondents. **Conclusion:** The study reveals increasing overweight and obesity among *Khatik* women in Delhi, driven by factors like age, education, urban living, and economic status. Overweight or obese women tend to have more live births and conceptions compared to underweight and normal-weight women, highlighting disparities in reproductive outcomes across BMI categories.

Keywords: Body Mass Index (BMI), *Khatik* Community, Conception, Cohabitation, Live Birth (LB), Nutrition, Dietary Intake, Delhi

Introduction

Demographics encompass statistical data that provides an overview of populations and their attributes. The analysis of a population's characteristics, encompassing elements like age, race, and gender, is denoted as demographic analysis. The statistical portrayal of socio-economic factors, which includes employment, education, income, marriage rates, and birth and death rates, is conventionally labeled as demographic data.

The dietary intake pattern exerts a substantial influence on human health[1,2]. Malnutrition stands as a pivotal global concern, necessitating a thorough and sustained intervention strategy. Nearly one-third of the global population grapples with at least one form of malnutrition, be it underweight, overweight, or obesity[3,4]. Adequate nutrition constitutes a cornerstone of individual health, with pronounced significance for the women demographic. Within the context of developing nations, women manifest an elevated susceptibility to nutritional insufficiencies compared to their male counterparts. This predilection is intricately associated with variables encompassing reproductive biology, social stratification, economic constraints, and educational disparages[5]. Research findings indicate that suboptimal nutritional status contributes to a spectrum of medical and obstetric complications, including cardiac and respiratory disorders, anaemia, premature rupture of membranes, endometritis (infection of the endometrium), intrauterine fetal growth retardation, spontaneous abortion, premature delivery, and low birth weight[6,7]. Insufficient and inappropriate dietary intake patterns, particularly among women of reproductive age, have led to a deficiency of essential nutrients, especially during pregnancy and lactation in Nepal. In this context, 18% of women are reported to be malnourished and 35% experience anemia[8], posing a significant threat to the physical, mental, and social well-being of women[9].

Moreover, factors such as reproductive biology, poverty, inadequate education, socio-cultural traditions, and household disparities contribute to undernutrition in women[10]. Women who have a restricted intake of animal source foods, fruits, and vegetables are at an elevated risk of micronutrient deficiencies[11].

Nutritional status is an indicator of a population's comprehensive well-being. Ensuring women's adequate nutritional status is crucial for their own good health and enhanced work capacity and for the well-being of their offspring[9]. Conversely, poor nutrition signifies a heightened health risk for both mothers and their offspring[12].

Aim of the study was to study the relationship between the nutritional status of *Khatik* women in North East Delhi and their socio-demographic and reproductive profiles.

Objectives

- To determine how Body Mass Index (BMI) variations correlate with the age of the *Khatik* women in North East Delhi

- To investigate the dietary intake patterns of the respondents across different BMI categories, focusing on the weekly dietary intake pattern

- To examine the relationship between BMI and reproductive variables among *Khatik* women

- To provide insights to develop targeted interventions aimed at improving the nutritional and reproductive health of *Khatik* women based on the identified relationships and underlying mechanisms

Material and Methods

Design of the Study and Recruitment of Participants

A cross-sectional investigation was carried out within the *Khatik* community of North East Delhi. The data for the present study were collected from 400 married *Khatik* schedule caste group women (15-45 years) from Delhi. The sample size of 400 was calculated using an online sample size calculator Raosoft[13], giving a prevalence estimate with a 95% confidence level for a total number of Scheduled Caste (SC) population in Delhi, i.e., 529470 as per census, 2011[14]. Participants were included in the study after obtaining their consent. Data regarding both socio-demographic factors and the nutritional status of women were gathered. The socio-economic status of the women was evaluated using Kuppuswamy's socio-economic scale 2019[15].

Tools for data collection

Data were collected using a structured interview schedule, which had the factors such as demographic and socio-economic information, dietary patterns, and anthropometric measurements. All the questions in the interview schedule were selected using various research papers. Participant recruitment was conducted through door-to-door visits targeting randomly selected individuals who met predefined inclusion criteria and expressed willingness to engage in the study. The inclusion criteria were only married women belonging to *Khatik* population residing in North East Delhi aged between 18-45 years of reproductive age and having at least one child. Consent was obtained from all the participants before the data collection. Prior to the main data collection, a pilot study was conducted to pre-test the questionnaires using a sample of 20 individuals.

The socio-demographic variables gathered encompassed gender, age, educational attainment, marital status, occupation, household size, and income level. The nutritional status included dietary habits, the week's dietary details like number of full meals and half meals, frequency of vegetables, legumes, fruits, milk and milk products and non-vegetarian diet, source of water, source of milk, kind of milk, and amount of milk consumption per day were taken. Height and weight measurements were taken to compute the Body Mass Index (BMI).

Operational Definitions

Body Mass Index (BMI): BMI is the method of utilizing an adult's height and weight to broadly place them into underweight, normal weight, overweight, and obese categories. An individual's BMI is important in determining potential future health issues and has been widely used as a factor in determining various public health policies[16].

Metric units: Weight (Kilograms) divided by height squared (Meters) BMI $= kg/m^2$

Cut offs as per World Health Organization (WHO)[17]

- Underweight: $<16 \, kg/m^2$
- Underweight: 16.0 to $18.4 \, kg/m^2$
- Normal weight: 18.5 to $24.9 \, kg/m^2$
- Overweight: 25.0 to $29.9 \, kg/m^2$
- Obese: 30.0 to $34.9 \, kg/m^2$

Data Analysis

The data collected were inputted into Microsoft Excel spread sheets, and statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 23.0. Various analytical techniques were employed, including determining the median, interquartile range, counts, and proportions for both categorical and continuous variables. Chi-square tests were utilized to compare explanatory variables. In contrast, the Mean ± Standard Deviation (SD) test was employed to compare metrics such as age, age at marriage, and number of live births across

different BMI categories. All reported p-values were two-sided, and significance was established at p-value, <0.05.

Results

The below Table 1 indicates a comprehensive analysis of BMI categories across different demographic factors, specifically education category, occupation category, and economic status. In the present study, there was no statistically significant association between education levels and BMI categories, as evidenced by the p-value of 0.287.

Individuals classified as unemployed and unskilled show a higher prevalence of underweight, but the difference is not statistically significant compared to those in the 'Others' category. The p-value of 0.252 suggests that the observed differences in BMI distribution among economic status groups were not statistically significant. Respondents from upper-lower-middle-class families were found to be more overweight compared to those from lower and lower-middle-class families, as shown in Table 1.

Table 1: Comprehensive analysis of Body Mass Index (BMI) categories across different demographic factors, specifically education category, occupation category, and economic status

Variables		BMI n (%)			p-value
		Under weight	Normal	Overweight	
Educational Categories	Illiterate and Primary level of education	5 (23.81)	25 (19.69)	67 (26.59)	0.287
	High School and Intermediate level of education	13 (61.9)	65 (51.18)	131 (51.98)	
	Graduate and above	3 (14.29)	37 (29.13)	51 (21.43)	
Occupational Category	Unemployed and Unskilled	21 (100)	114 (89.76)	232 (92.06)	0.275
	Others	0 (0)	13 (10.24)	20 (7.94)	
Economic Status	Lower Class	5 (23.81)	23 (18.11)	48 (19.05)	0.252
	Lower Middle Class	0 (0)	7 (5.51)	27 (10.71)	
	Upper Lower and Middle Class	16 (76.19)	97 (76.38)	177 (70.24)	

The present paper dealt with the nutritional status and reproductive variable of *Khatik* women in Delhi, utilizing BMI as a key indicator of health. Analysis revealed significant differences across BMI categories for age and reproductive factors. As the age of the respondent's increased, the chances of getting overweight/obese were high. The mean age of the respondents was 34.88 years with SD of 6.66 years. The mean age of underweight women was 31.71 years with SD of 6.23. Age at marriage and first conception showed no significant variance. Overweight/obese women had a higher number of live births, 2.27, SD = 1.1, as compared to underweight (1.86, SD= 0.65) and normal weight (2.02, SD= 0.89) women. Similarly, Overweight/obese respondents had a higher number of conceptions of 21.91, SD= 2.8 as compared to women with a normal weight of 22.24, SD= 2.66 and underweight 21.86, SD= 2.33. There were discernible differences in the total number of live births and conceptions among underweight, normal weight, and overweight/obese groups. Specifically, underweight women tended to have fewer live births and conceptions compared to their counterparts with normal or higher BMI (Table 2).

Table 2: Table presents association between BMI and Reproductive variable using Mean ± SD among *Khatik* women population

Variable	Mean ± SD			p-value
	Underweight	Normal	Overweight/obese	
Age	31.71±6.23	33.43±6	34.88±6.66	0.022
Age at Marriage	20.48±2.27	20.71±2.63	20.38±2.74	0.526
Total Live Birth	1.86±0.65	2.02±0.89	2.27±1.1	0.031
Total number of conception	1.95±0.67	2.2±0.95	2.58±1.12	<0.001*
Age at first conception	21.86±2.33	22.24±2.66	21.91±2.8	0.527
Age at cohabitation	20.48±2.27	20.74±2.61	20.42±2.77	0.543

*<0.001: Statistically significant

The study's findings indicated a predominant presence of respondents in the overweight/obese category of BMI, whether they followed a vegetarian diet 214 (84.9%) or a non-vegetarian one 38 (15.08%). A substantial majority of women obtaining milk from a milkman, 199 (78.97%), were classified as overweight/obese, whereas 49 women (19.44%) in the same category received milk from Mother Dairy. Furthermore, a significant proportion of women consuming buffalo milk (94.8%) were found to be overweight/obese compared to those consuming cow's milk (5.16%). However, all calculated p-values failed to achieve statistical significance (Table 3).

Table 3: Presents association between Dietary pattern and BMI among Khatik women population

Variable	BMI n (%)			p-value
	Underweight	Normal	Overweight/obese	
Dietary Habit				
Vegetarian	16 (76.19)	105 (82.68)	214 (84.92)	0.537
Non-Vegetarian	5 (23.81)	22 (17.32)	38 (15.08)	
Source of Milk				
Domestic	0 (0)	2 (1.57)	4 (1.59)	
Milkman	14 (66.67)	92 (72.44)	199 (78.97)	0.417
Mother Dairy	7 (33.33)	33 (25.98)	49 (19.44)	
Kind of Milk				
Cow	1 (4.76)	9 (7.09)	13 (5.16)	0.734
Buffalo	20 (95.24)	118 (92.91)	239 (94.84)	

The study findings indicated that overweight/obese women had a higher median number of full meals (Median 21, IQR: 19-22) compared to both normal weight (Median 21, IQR: 18-22) and underweight (Median 19, IQR: 17-24) women. Similarly, underweight individuals had a lower median consumption of milk products (Median 3, IQR: 2-5) compared to both normal weight (Median 4, IQR: 3-6) and overweight (Median 4, IQR: 3-6) respondents. Additionally, overweight/obese and normal weight women exhibited a higher frequency of consuming fruits (overweight/obese: median 4, IQR: 3-6; normal weight: median 4, IQR: 4-5) compared to underweight women (Median 3, IQR: 1-5) (Table 4).

Table 4: Comparison of Weekly Dietary intake amongst different BMI categories of *Khatik* women

Variables	BMI median (IQR)			p-value
	Underweight	**Normal**	**Overweight/obese**	
No of Full Meals	19 (17-24)	21 (18-22)	21 (19-22)	0.34
No of Half Meals	7 (6-8)	7 (7-7)	7 (7-7)	0.673
Frequency of Milk Products	3 (2-5)	4 (3-6)	4 (3-6)	0.276
Frequency of Pulses	5 (4-6)	5 (5-6)	5 (5-6)	0.53
Frequency of Fruits	3 (1-5)	4 (4-5)	4 (3-6)	0.483

Discussion

Most of the respondents in the present study were found to be overweight, primarily belonging to upper-lower-middle-class families. As women's age increases, so does the likelihood of being overweight or obese, as evidenced by the average age of overweight/obese respondents, which was higher than that of underweight respondents. Additionally, the research indicates that women with High School and Intermediate education levels are more likely to be overweight or obese compared to those with lower educational attainment.

Furthermore, overweight/obese women tend to have more live births compared to underweight and normal-weight women. Similarly, overweight/obese respondents report a higher number of conceptions compared to women with normal weight and underweight. These findings highlight significant differences in both live births and conceptions among the underweight, normal weight, and overweight/obese groups.

The issue of overweight or obesity is no longer confined solely to developed nations. Currently, this epidemic presents new obstacles in developing countries, demanding urgent attention and prevention efforts. These nations confront a dual challenge of nutritional issues as they continue to grapple with the longstanding problems of under nutrition and hunger[18]. Numerous academics have elucidated the phenomenon through the lens of the 'nutritional transition in developing nations,' which denotes the progression from traditional dietary patterns and ways of life to Westernized diets characterized by high levels of saturated fats, sugar, and processed foods. This transition is often coupled with decreased physical activity, improved transportation infrastructure, enhanced healthcare access, and heightened stress levels, particularly noticeable in swiftly expanding urban areas[19,20].

In the megacities, the situation is alarming, with many women either overweight or obese in the selected cities studied in India. This situation mirrors that of numerous developed nations, where the prevalence of overweight and obesity is steadily increasing.

Biswas et al., (2022), Haregu et al. (2018), Nie et al. (2021), and Rout et al. (2009)[21-24] have underscored the influence of socio-demographic variables, including religion, residency, wealth index, age cohort, educational attainment, marital status, parity, and household size on the nutritional well-being of women in India. Similarly, in the present study, we have compared the socio-demographic factors (such as education and economic status) and occupation with nutritional status using BMI as an important indicator of women in Delhi. Women belonging to Scheduled Castes (SCs) and Scheduled Tribes (STs) originating from impoverished economic backgrounds exhibit a higher propensity for being underweight compared to women from different economic strata[25]. Over the years, obesity and overweight have been steadily increasing in India, surpassing the global average[26]. Approximately 25% of women aged 15–49 in India is now classified as overweight or obese, marking a nearly twofold increase from previous study estimates. While obesity and overweight have historically been associated with developed nations, the epidemic is increasingly affecting developing countries like India. This surge presents a challenge, particularly in a nation grappling with the double burden of malnutrition and hunger[18]. Scholar's attribute this rise to the nutritional transition underway in developing countries, characterized by a shift from traditional Indian diets to adopting Western dietary patterns. This transition includes factors such as sedentary lifestyles, consumption of fast food, heightened stress levels, environmental pollution, and urbanization[20,27,28].

As individuals age, there is a noticeable increase in the prevalence of overweight or obesity, indicating a positive association between these conditions. Advancing age is often accompanied by the onset of non-communicable diseases[29] and a rise in parity[30], both of which are common factors contributing to overweight or obesity.

Among women with higher levels of education, there is a higher prevalence of overweight or obesity, consistent with

findings from other studies[31,32]. Additionally, other socio-economic factors such as urban residence, higher wealth index, and elevated social status show positive associations with overweight or obesity. The correlation between higher education levels and increased likelihood of overweight or obesity can be attributed to improved employment prospects for women, leading to greater self-reliance and higher socio-economic status[29].

Women with a greater number of children, a history of caesarean delivery, or previous terminated pregnancies tend to have an increased likelihood of being overweight or obese. Additionally, the weight gained during pregnancy, which often persists long-term, is both a contributing factor and highly associated with caesarean deliveries[33-36].

Specifically, underweight women tend to have fewer live births and conceptions compared to their counterparts with normal or higher BMI. These findings underscore the intricate interplay between nutritional status and reproductive health among *Khatik* women in Delhi, emphasizing the importance of addressing these factors comprehensively within healthcare interventions and policies.

Relevance of the study

The outcomes of this research bear significance in the realm of promoting nutritional wellness among women in India, offering valuable insights to customize nutritional counselling and interventions for both individual and community contexts.

Conclusion

The current study illustrates the escalating rates of overweight and obesity among *Khatik* women in Delhi. Key determinants such as advancing age, higher educational attainment, urban living, and elevated economic status emerge as significant factors contributing to the prevalence of overweight or obesity among women in reproductive age groups. These findings highlight noticeable disparities in the total number of live births and conceptions among women classified under different BMI categories. Specifically, underweight women demonstrate fewer live births and conceptions compared to their counterparts with normal or higher BMI.

Acknowledgement

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Ethical consideration

Approval for the study was granted by the Departmental Research Committee (A4260519002) on February 14, 2020. Consent was obtained from all the participants before the data collection.

Authors' Contribution

KS: Conceptualization, primary efforts; RD: data analysis and manuscript preparation; PS: Statistical analysis.

Data availability statement

Data will be available with corresponding author on request

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