WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

To Study the Socio-demographic Profile and Nutritional Status of Occupational Women Using Dietary Diversity Index of Surat City

Neha Solanki [a], ***Shazia Shrama*** [b]

[a] *Assistant Professor,Vanita Vishram Women's University, Surat,India*
[b] *Associate Professor, S.M.Patel Home science College, Vallabh Vidhyanagar, Aanand, India*
DOI: https://doi.org/10.55248/gengpi.5.0524.1249

A B S T R A C T

The objective of this study was to assess the sociodemographic aspects and investigate whether it related to the nutritional status of different occupational women. The study was conducted in urban areas of Surat city, focusing on middle- and high-income group textile industries, during October-November, 2021. A total of 81 women with a mean age of 31 years (SD6.9) were studied. A significant proportion of women, approximately 68%, achieve minimum dietary diversity (MDD-W) by consuming foods from five or more food groups. The observed rise in obesity aligns with significant improvements in living standards within urban settings, where lifestyle factors have undergone substantial changes. Among women aged 20-35, non-working women had a higher prevalence of pre-obesity and obesity (type-1) compared to their working counterparts. The findings of study indicate that a significant proportion (about 68%) of women (about 80%) achieve MDD-w by eating food from five food groups, indicating that women from lower-income households have a notable prevalence of achieving MDD. These findings emphasize the need for targeted interventions to ensure optimal nutrition and overall health in urban populations.

Keywords: Nutritional Status, Sociodemographic profile, Dietary diversity

1. Introduction

1.1 Sociodemographic characteristics

Surat, one of the fastest-growing cities in India, has experienced significant population growth over the years. Its population has more than quadrupled since 1961, reaching over 4.5 million people. The city has registered the highest population growth rate since Independence, and its density has decreased from 25,194 persons per sq. mm in 2001 to 13,680 persons per sq. km in 2011 due to the expansion of the city's limits. However, Surat has faced challenges in terms of gender ratio, with a decline from 921 in 1961 to 756 in 2011. Surat is the 8th largest city in India in terms of population. The city has experienced rapid population growth and urbanization, leading to the expansion of the built-up area. Surat's gender ratio has notably declined over the past five decades, reaching 756 females per 1000 males in 2011. Female literacy trends in Gujarat have shown improvement, with only one district having a female literacy rate below 50% in 2011 compared to eight in 2001. Surat witnessed a significant increase in female literacy to 80.4% in 2011, surpassing Ahmadabad. However, the number of female workers in Gujarat has been decreasing steadily since 2004, with rural areas experiencing a decline from 43% in 2005 to 28% in 2011-12. Socio-economic factors like education and standard of living influence women's health and workforce participation in Gujarat. Socio-economic factors have been recognized as influential determinants of women's health, including nutritional status and reproductive health issues (WHO, 2000). Additionally, women's workforce participation is shaped by socio-economic and cultural factors such as the standard of living, education, religious beliefs, and social status (Nam, 1991; Malhotra and Mather, 1997; Panda, 2003).

1.2 Anthropometric measurements

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The field of anthropometry involves a variety of human body measurements. Weight, stature (standing height), recumbent length, skinfold thicknesses, circumferences (head, waist, limb, etc.), limb lengths, and breadths (shoulder, wrist, etc.) are examples of anthropometric measures. Several indexes and ratios can be derived from anthropometric measurements. Perhaps the most well-known indicator of body fatness is the body mass index or BMI. BMI is a ratio of weight relative to height that is used to identify underweight/thinness and overweight and obesity in adults. It is calculated using the formula (weight in kilograms)/ (height in meters)2 and its cutoffs are not age- or sex-specific. While BMI is commonly used to identify underweight, overweight, and obesity in adults, it does not directly measure body fat and cannot differentiate between muscle and fat weight.

1.3 Minimum Dietary Diversity Indicator for Women(MDD-W)

MDD-W is a dichotomous indicator of whether or not women 15–49 years of age have consumed at least five out of ten defined food groups the previous day or night. The proportion of women 15–49 years of age who reach this minimum in a population can be used as a proxy indicator for higher micronutrient adequacy, one important dimension of diet quality.

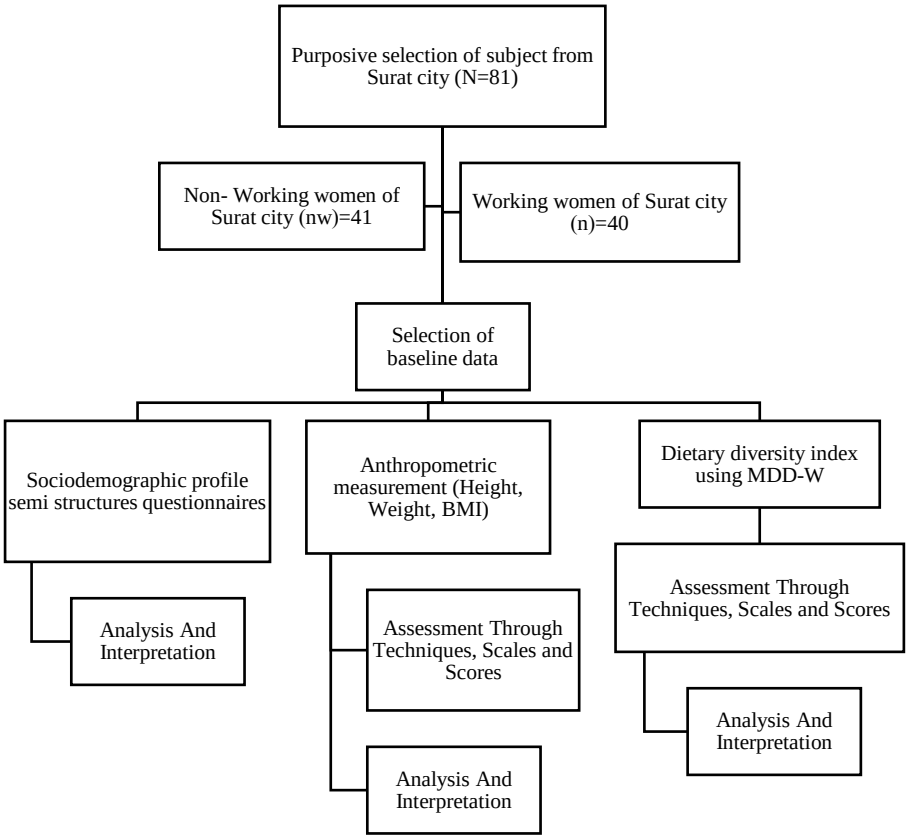
The ten food groups are:1. Grains, white roots and tubers, and plantains, 2. Pulses (beans, peas and lentils), 3. Nuts and seeds, 4. Dairy, 5. Meat, poultry and fish, 6. Eggs, 7. Dark green leafy vegetables, 8. Other vitamin A-rich fruits and vegetables, 9. Other vegetables, 10. Other fruits.

2. Objectives

1. To assess the sociodemographic profile of working and non-working women selected randomly in Surat city.
2. To assess the nutritional status of working and non-working women using anthropometric measurements (i.e., weight, height, BMI).
3. *To assess the dietary diversity intake using minimum dietary diversity index and co related with working and non-working women*

3. Methodology

Fig. 1 Flow chart of methodology used for the study



3.*1 Research Setting*

The study was conducted in urban areas of Surat city, focusing on middle- and high-income group textile industries, during October 26th to November 10th, 2021.

3.*2 Research Design:*

Two panels of women were randomly selected:

1. Working women (n=40)
2. Non-working women (n=41)

These panels were categorized based on age groups: 20-35 years and 36-49 years.

3.*3 Data Collection:*

- Demographic and socioeconomic information for each household was collected via a Google form.
- The questionnaire covered sociodemographic variables including age, sex, educational level of the respondent and head of the family, occupational levels of the respondent, income sources, and characteristics of residency and living conditions.

3.*4 Objectives and Measures*

3.*4.1. Sociodemographic Characteristics*

- **Women:** Factors considered: Age, education, occupation, annual income, and type of residence.
- **Household:** Factors considered: Age of household head, education of household head, and household size.

3.*4.2. Anthropometric Measurements*

- Anthropometry involves measuring various dimensions of the human body, including bone, muscle, and adipose tissue. Key anthropometric measures include: Weight, Stature (standing height), Recumbent length, Skinfold thicknesses, Circumferences (e.g., head, waist, limbs), Limb lengths, Breadths (e.g., shoulder, wrist).
- Several indexes and ratios can be derived from anthropometric measurements. Perhaps the most well-known indicator of body fatness is the body mass index or "BMI." BMI values are calculated for this study participants using measured height and weight values as follows: weight (kilograms)/height (meters^2).
- Asian BMI criteria are used to screen for weight categories:
- Underweight (BMI values < 18.5), Normal or desirable weight (BMI values 18.5-22.9), overweight (BMI values 23.0- 24.9), pre-obese (BMI values 25.0- 29.9) Obese (BMI values ≥30) obese- type Class I (BMI values 30.0-40.0), Obese-Class II (BMI values 40.1- 50.0) and extremely obese (BMI values > 50.1) (National Institutes of Health, 1998). The National Institutes of Health, Centres for Disease Control and Prevention (CDC), and many other research groups have reported on the health risks associated with overweight and obesity using interview and health examination data.

3.*4.3. Minimum Dietary Diversity for Women (MDD-W):*

The Minimum Dietary Diversity for Women (MDD-W) is a crucial tool for assessing the dietary diversity of women of reproductive age. The Minimum Dietary Diversity for Women (MDD-W) indicator is a valuable tool developed by the Food and Agriculture Organization (FAO) and partners. It assesses the proportion of women aged 15-49 years who consumed food items (at least 15g) from at least five out of ten defined food groups on the previous day or night. The MDD-W indicator is associated with a higher probability of nutrient adequacy for 11 micronutrients. Practitioners can use the MDD-W indicator as a proxy for micronutrient adequacy in women of reproductive age.

The list-based method is completed prior to data collection and requires the survey team to select the most commonly consumed food items to be included on the questionnaire. The enumerator solicits yes or no answers to questions from the respondents regarding food groups with a limited number of food items, concerning respondent's food consumption over the previous day or night. It can be done by hand or using a spreadsheet or database. The MDD-W variable is calculated. The value of this variable will range from 0- 10. Values of the questions answered will be either '0' or '1'. Measurement: Dietary diversity is usually measured by summing the number of foods or food groups consumed over a reference period. Sum (A+ B + C + D + E + F + G + H + I + J + K + L)

The score is then derived by getting the percentage by dividing the above sum by the total number of households.

Indicator calculation formula:

$$\text{Percentage of WRA who consumed foods and beverages from} \geq \text{five food} = \frac{\text{who consumed foods and beverages from} \geq \text{five food groups during the previous day}}{\text{Total number of WRA surveyed}} \times 100$$

3.5 Statistical analysis

Socio-demographic variables were presented as descriptive statistics. Socio demographic variables and anthropometric parameters were summarized as means and standard deviations. Student's T test was used to calculate the signification between the anthropometric (weight)and age parameters of both the groups.

4. Result and discussion

4.1 Sociodemographic characteristics

A total of 81 women with the mean age of 31 years (SD±6.9) were studied. Table 1.1 summarizes the descriptive characteristics (Mean ± standard deviation) of the women living in urban regions. No significant difference was observed for anthropometric (weight, height and BMI). The target group was further stratified by occupation and each group were compared for dietary diversity and sociodemographic characteristics.

Table 1 Sociodemographic profile of the working and non-working women

	Working Women (n=40)		**Non-Working Women (nw=41)**	
Age group	**20-35 years**	**36-49 years**	**20-35 years**	**36-49 years**
Age (Percent)	33(82.5)	8(17.5)	31(75.6)	**9(24.4)**
Mean ± SD	28.3±3.8	40.4±3.1	27.9±4.1	**42.9±4.6**
Education level				
Primary	1(3.0)	0(0)	1(3.2)	**3(30)**
Secondary	0(0)	1(14.3)	2(6.5)	**1(10)**
Higher secondary	3(9.09)	0(0)	5(16.1)	**1(10)**
Graduation	10(30.3)	3(42.9)	14(45)	**5(50)**
Post-graduation	18(54.5)	3(42.9)	9(29)	**0**
Ph.D./doctorate	1(3.0)	0	0	**0**
Household income	**Frequency (n)**	**Percent (%)**	**Frequency (n)**	**Percent (%)**
>50,000/- (Low)	2	5	6	**14.6**
50,000-1,00,000	13	32.5	11	**26.8**
1,00,000-2,00,000	10	25	13	**29.3**
2,00,00-5,00,000	8	20	5	**12.2**
More than 5,00,000	**7**	**17.5**	**6**	**14.6**

Table 1 presents the demographic characteristics of the participants, focusing on women aged 20-35 years in both working and non-working groups. The mean age for working women was 28.3 years (SD ± 3.8) and for non-working women was 27.9 years (SD ± 4.1). In the working women group, 82.5% were less than 35 years old, while in the non-working women group, this percentage was 75.6%. Regarding educational attainment, the majority of working women (54.5%) and a significant portion of non-working women (29%) had completed post-graduation. A small percentage (3.0-3.2%) of both working and non-working women had completed primary level education. Additionally, 9% of working women and 16.1% of non-working women had completed higher studies. A considerable proportion of working women (30.3%) had graduated, whereas a larger percentage of non-working women (45%) had reached this level of education. Regarding the type of house attainment, about 44.4% working women reside in owned house and 40.7% non-working women reside in owned house. 4.9% of working women and 9.9% non-working women reside in ranted house. The total number of family member of working and non-working women. Maximum numbers are belonging to18-44 years and 45-60 years for both the groups. Minimum numbers for >60 years. Earning group members are maximum in number from both the group.

Fig. 2 Household income (annual) of working and non-working women

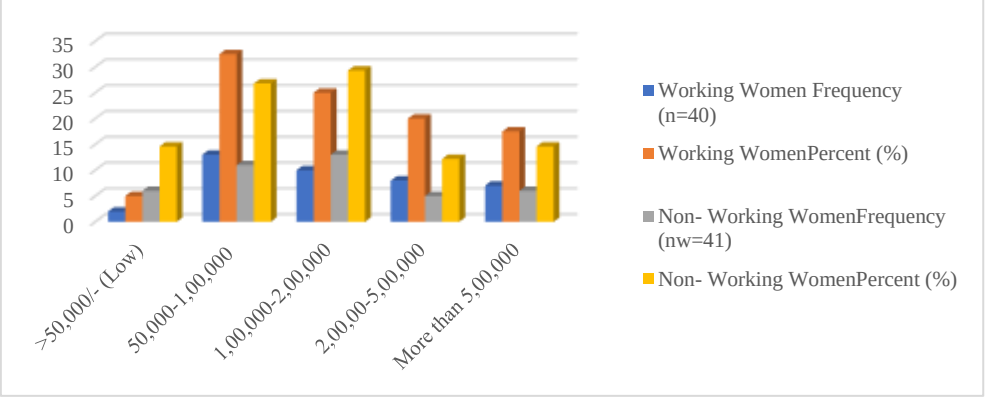


Figure 2 shows that When comparing the income distribution between working and non-working women in the surveyed urban areas of Surat city, it's evident that working women generally exhibit higher and more stable income levels compared to non-working women. The results showing a significant proportion of working women earning between 1,00,000/- to 5,00,000/- annually are more acceptable in terms of economic stability and financial independence. This suggests that their engagement in paid employment contributes significantly to their household income and socioeconomic status. On the other hand, while non-working women demonstrate a wider range of income distribution, with substantial portions falling within the 1,00,000/- to 2,00,000/- range, their financial reliance on other household members or sources may imply a degree of vulnerability or dependence. Thus, while both groups have their own socioeconomic dynamics, the results indicating higher and more stable incomes among working women are generally more acceptable in terms of economic empowerment and resilience.

Fig. 3 Type of occupation

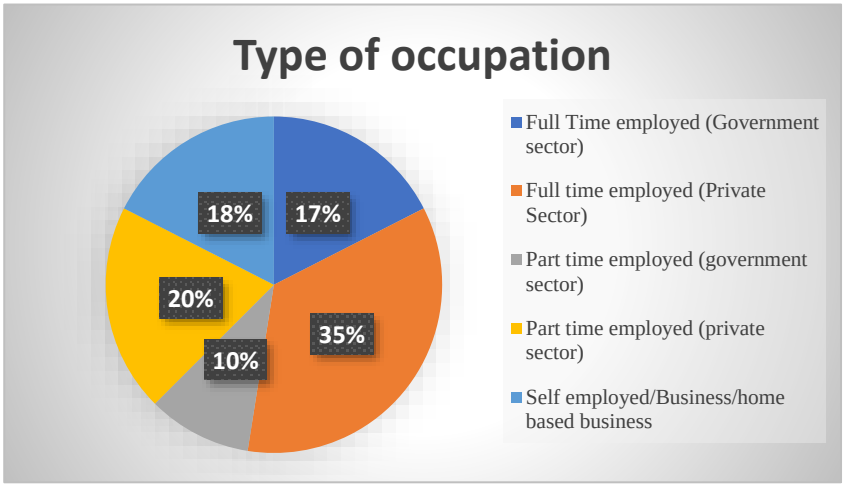


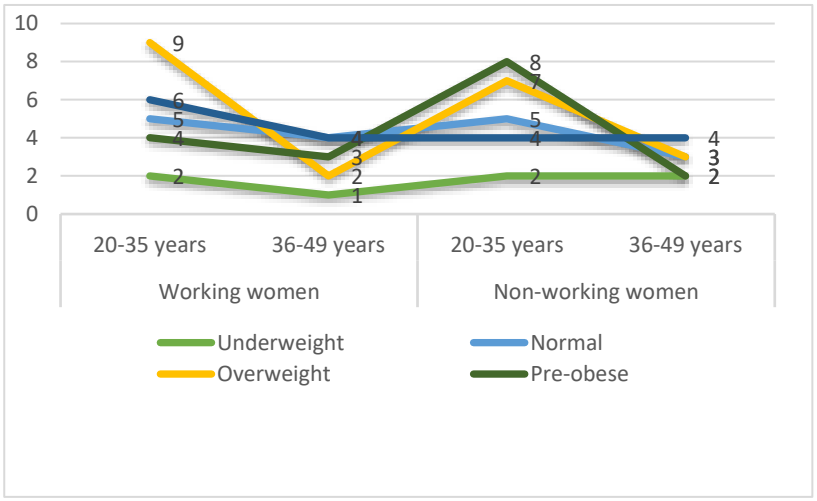
Figure 3 summarized that 17.5% of women working at full time government sector. 10% involved in part time government sector. 35% and 20% employees of full time and part time in private sectors. 17.5% of women are self-employed or involved in business.

Table 2 Mean anthropometrics measurements of working and non-working women of Surat city

	Working women (n=41)		**Non-working women (nw=40)**	
Age group	**20-35 (Years)**	**36-49 (Years)**	**20-35 (Years)**	**36-49 (Years)**
Weight	61.2	65.0	55.8	66.2
Mean ± SD	12.2	10.1	7.3	12.0
Height	158.1	160.0	152.3	156.5
Mean ± SD	8.7	6.4	10.2	8.7

Table 2 summarized the average height and weight along with standard deviation of both the samples. Working women tend to have slightly higher weights and heights compared to non-working women within the respective age groups. However, individual variations exist, and lifestyle factors play a significant role in determining these differences. The study reveals a notable prevalence of obesity within urban populations, aligning with findings from a comprehensive review conducted by Ramachandran and Snehalatha (2010). Their review underscores a shifting trend towards increased obesity rates in semi-urban and urbanizing rural areas. The observed rise in obesity aligns with significant improvements in living standards within urban settings, where lifestyle factors have undergone substantial changes. These changes, characterized by shifts towards sedentary behaviors and dietary patterns, contribute to the escalating prevalence of obesity. The current research contributes to the growing body of evidence highlighting the pressing public health concern posed by obesity in urban environments, emphasizing the urgent need for targeted interventions aimed at mitigating its adverse health effects.

Fig. 4 BMI of working and non-working women



Analysis of Figure 4 reveals distinct patterns in weight status between working and non-working women across different age groups. This graph provides insights into how employment status may correlate with weight categories among women. It's essential to consider other factors (such as lifestyle, diet, and physical activity) when interpreting these results. Among women aged 20-35, a higher proportion of non-working women are pre-obese compared to their working counterparts. Additionally, more non-working women in this age group are obese (type-1) compared to working women. Conversely, among women aged 36-49, a higher percentage of working women are overweight compared to non-working women. Notably, a larger proportion of non-working women in this age group are pre-obese. However, both working and non-working women in the 36-49 age group exhibit similar rates of obesity (type-1). These findings suggest that while weight status varies between working and non-working women across different age groups, there are nuanced differences in the prevalence of overweight, pre-obesity, and obesity between the two groups.

Table 3 Statistical co-relation between weight & height for working women:

	Value	**Df**	**p value**
T-test	**-0.199**	**39**	**0.84** **Non-significant**
Valid number of test (N)	**40**		

The table 3 shows that the value tabulated from T-test and p value is -0.199[a] and 0.84 which is greater than 0.05. This reveals that there is a negative co-relation between working women height and weight. The factors like height and weight have no strong significant variable for the working women.

Table 4 Statistical co-relation between weight and height for non-working women:

	Value	**Df**	**p value**
T-test	**2.28[a]**	**40**	**0.027** **Significant**
Valid number of test (N)	**41**		

The table 4 shows that the value tabulated from T-test and p value is 2.28[a] and 0.027 which is less than 0.05. This reveals that there is a positive co-relation between non-working women height and weight. It shows there is strong association between non-working women height and weight that affects into our present study.

4.2 Minimum Dietary Diversity for Women (MDD-W)

Laura, et al (2019) a study conducted in the region of Kayes, Mali, reported a 27% prevalence of women reaching the Minimum Dietary Diversity for Women of Reproductive Age (MDD-W). The recent data reveals about 68% of total women reaching MDD-W. The study highlighted that women who achieved MDD-W consumed animal source foods and/or vitamin A-rich vegetables and fruits more frequently than those who did not. These women consumed milk and its products, other vegetables and/or cereals-based products more frequently than did other women. About 87.7% women consumed cereals, 74% consumed pulses, 56.8% have nuts & oilseeds, 96.3% have milk & it's products and other vegetables, 72.8% have dark green leafy vegetables and very less percentage found for egg, flash meat and fruits. The consumption of calorie dense food groups is most common then seasonal and nutritional

point of view. Tables 3 reveals that about 87.7% women consumed cereals, 74% consumed pulses, 56.8% have nuts & oilseeds, 96.3% have milk & it's products and other vegetables, 72.8% have dark green leafy vegetables and very less percentage found for egg, flash meat and fruits. The consumption of calorie dense food groups is most common then seasonal and nutritional point of view.

Working women tend to consume more cereals, pulses & nuts, and oilseeds compared to non-working women. However, non-working women have a slightly higher consumption of milk and its products. Both groups show similar patterns for flesh meat. Eggs, on the other hand, are significantly more consumed by non-working women. Dark green leafy vegetables are equally consumed by both groups, while vitamin A-rich fruits and other vegetables have higher consumption rates among non-working women. Local and seasonal fruits also see higher consumption among non-working women. In summary, while there are some similarities in dietary habits between the two groups, there are also notable differences. Working women tend to consume more cereals, pulses & nuts, and oilseeds, whereas eggs show significantly higher consumption among non-working women. These insights can be valuable for nutritionists and policymakers focusing on public health initiatives.

Table 5 Minimum Dietary Diversity score of working and non-working women age group of 20-49 years of Surat city

Dietary Diversity Score				
	Working Women		**Non- Working Women**	
Dietary score	**Frequency (N)**	**Percent (%)**	**Frequency (N)**	**Percent (%)**
0	0	0	1	1.2
3	1	2.5	2	2.5
4	6	15	5	6.2
5	5	12.5	6	7.4
6	14	35	7	8.6
7	5	12.5	9	11.1
8	7	17.5	5	6.2
9	1	2.5	6	7.4
10	1	2.5	0	0
Total	**40**		**41**	

4.3 Minimum dietary diversity Indicator calculation

i. Working women MDD score:

Percentage of WRA who consumed foods and beverages from ≥ five food = $\frac{\text{who consumed foods and beverages from} \geq \text{five food groups during the previous day}}{\text{Total number of WRA surveyed}}$ X 100

= 28/81×100

= 33.3%

Non- working women MDD score:

Percentage of WRA who consumed foods and beverages from ≥ five food = $\frac{\text{who consumed foods and beverages from} \geq \text{five food groups during the previous day}}{\text{Total number of WRA surveyed}}$ X 100

= 27/81 ×100

= 34.6%

The findings of study indicate that a significant proportion of women, approximately 68%, achieve minimum dietary diversity (MDD-W) by consuming foods from five or more food groups. This finding suggests a greater likelihood of meeting their micronutrient needs compared to women consuming foods from fewer food groups. The use of a dichotomous indicator with an established cutoff value facilitates the calculation of MDD-W prevalence, which holds important operational implications. However, for research purposes, we also employed a continuous variable called the 10-Food Group Women's Dietary Diversity Score (WDDS-10), ranging from 0 to 10. Interestingly, our analysis reveals that 33.3% of working women and 34.6% of non-working women reached MDD-W, representing a higher percentage compared to a previous study where only 27% of women achieved MDD-W.

These women reported consuming animal source foods and/or vitamin A-rich vegetables and fruits more frequently than others. Notably, milk & its products and other vegetables were among the most frequently consumed items. Although household food expenditure was not measured, we hypothesize that women in wealthier households may have benefited from higher income levels, allowing them to diversify their diets through the purchase of a variety of foods in the market.

5. Conclusion

The study of 81 women with a mean age of 31 years (SD±6.9) focused on urban regions. While no significant differences were observed in anthropometric measurements (weight, height, and BMI), demographic characteristics revealed intriguing patterns. Among women aged 20-35, non-working women had a higher prevalence of pre-obesity and obesity (type-1) compared to their working counterparts. Conversely, in the 36-49 age group, working women exhibited a higher percentage of overweight status. Interestingly, both groups had similar rates of obesity (type-1) in this older age range. Overall, the study highlights the rising prevalence of obesity in urban populations and underscores the need for targeted interventions to address this critical public health concern. The nuanced differences in weight status between working and non-working women across different age groups emphasize the complex interplay of lifestyle factors in shaping health outcomes. Lifestyle modifications and awareness campaigns are essential to combat obesity effectively and improve overall well-being. In conclusion, this study provides valuable insights into the dietary diversity patterns among women in urban areas, demonstrating a notable prevalence of achieving MDD-W. This may be attributed to socioeconomic factors, such as household income, which enables women to purchase a wider variety of foods. Additionally, our analysis highlights specific food groups that contribute significantly to dietary diversity, including animal source foods, vitamin A-rich vegetables and fruits, milk & its products, and other vegetables. These findings emphasize the need for targeted interventions aimed at promoting dietary diversity among women, particularly those from lower-income households, to ensure optimal nutrition and overall well-being. Moving forward, targeted interventions aimed at promoting dietary diversity, especially among women from lower-income households, are essential for improving nutritional outcomes and overall health in urban populations.

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