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Exploring the interplay of socio-economic and demographic factors on dietary diversity among women of Thiruvananthapuram district in Kerala: a comprehensive analysis

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Abstract: Nutrition is crucial for global health and development, with malnutrition presenting a substantial threat. India grapples with both undernutrition and overnutrition. Understanding the intricate relationship between socio-economic and demographic factors and dietary diversity is crucial for promoting public health and well-being. This comprehensive analysis delves into the impact of these factors on dietary habits. Socio-economic determinants such as income, education, and access to healthcare services, along with demographic characteristics such as age, gender, and household composition, are known to influence dietary choices significantly. Women of reproductive age are particularly at risk of inadequate nutrition, necessitating a focus on improving nutritional standards. Socio-economic and demographic factors significantly influence dietary diversity, highlighting the need for targeted interventions. Socio-economic and demographic characteristics notably influence a person's dietary diversity. There is a known concern regarding women's dietary patterns in their reproductive years. Still, a substantial push has not been made to tackle or enhance this matter through specific programmes or actions. This suggests a need for increased attention and measures to improve the dietary standards of women.

Key Words: *Nutrition, Women's Health, Dietary diversity, Dietary diversity score, Socio-economic and demographic factors*

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Introduction

Nutrition is essential for human health and development worldwide, and any form of malnutrition poses a significant threat to overall well-being. India faces a double burden of malnutrition in different forms, like undernutrition and overnutrition. A person's socio-economic status significantly influences their health (Wani, 2019); measuring an individual or family's economic and social standard is based on their education, income, and occupation. Socio-economic factors, including the physical environment, can directly or indirectly impact an individual's nutritional status. These factors can increase the risk of undernutrition, weight gain, and obesity. An individual's physical environment, which encompasses their home and workplace, can either promote or hinder a healthy lifestyle. Furthermore, socio-economic status directly relates to physical proximity to healthy food choices and preventive advice (Bhurosy & Jeewon, 2014). Nowadays, social status depends on various factors such as an individual's occupation, income, neighbourhood, membership in specific associations and organisations, materials, and possessions (Pandey et al., 2018).

Individuals with a high income may have better access to good health through nutritious food purchases, but poor education and inactivity can still lead to poor health. Conversely, those with low income and educational attainment might avoid seeking medical attention, impacting wider society (James et al.,1997; Smith et al., 2017). Income is more indicative of the current standard of living than education or occupation (Duncan et al., 2002). Traditional socio-economic statuses are interconnected and contribute to food choices in complex ways (Alkerwi et al., 2011; Darmon & Drewnoski, 2008). Maintaining a healthy, diversified diet can improve longevity and reduce the risk of chronic degenerative diseases (Patterson et al., 1994; Jacques et al., 2001b; Ruel, 2002). It also enhances nutrient intake, fibre, and antioxidants to prevent diseases like HIV/AIDS, diabetes, cancer, and vision loss (Johns & Sthapit, 2004).

To measure progress in dietary diversity in poor societies and low-income countries, examine the extent and occurrence of a shift away from traditional staple-based diets, which consist mainly of starchy roots and coarse grains and are based on a few food groups (Drewnowski & Popkin, 2009). Research indicates that a significant challenge faced by many impoverished households worldwide is the limited variety in their diets, posing a severe issue (Arimond et al., 2010; Torheim et al., 2010). Women of reproductive age (WRA) are particularly vulnerable to insufficient intake of essential micronutrients due to diets primarily reliant on starchy staples (Arimond et al., 2010; Torheim et al., 2010; Labadarios et al., 2011). Hence, it is crucial to gain insights into the dietary habits of diverse populations and identify the barriers preventing them from adopting nutritious eating practices (Chakona & Shackleton, 2017). This study assesses the influence of socio-economic and demographic factors, dietary diversity, and health status among women aged 18-40 in the Thiruvananthapuram district of Kerala.

Dietary diversity for women

The micronutrient deficiency is one of the most pressing issues in the world today. The need for a varied diet has long been recognised, and all people require a variety of meals to meet their critical nutrient needs. Women (especially those of reproductive age) require higher nutrient-dense diets than men, making them more susceptible to micronutrient deficiencies. In turn, women's and their children's health are harmed by micronutrient shortages (Issa et al., 2024).

Women of reproductive age are often nutritionally vulnerable due to the physiological demands of pregnancy and lactation. The undernutrition of mothers has long been considered a risk factor for maternal mortality as well as morbidity (Lartey, 2008). Women may be more petite and consume fewer calories, so they need a diet high in nutrients (Torheim & Arimond, 2013). Further, reproductive biology, poverty, inadequate education, sociocultural norms, and household distinctions contribute to women's undernutrition (Rampal & Bali, 2018).

If a woman experiences malnutrition during her growth and development, it can substantially impact her future well-being and the health of her offspring. When women are in good health and access necessary resources, they are better positioned to actively participate in their families and communities, leading to various beneficial outcomes. Women often play a crucial role in decision-making within households and communities. In such cases, women may be more likely to advocate for policies and practices that enhance the well-being of their families and communities as a whole (Guracho et al., 2022; Sariyev et al., 2020). Women who consume inadequate protein and carbohydrates are more likely to become seriously undernourished mothers (Sitotaw et al., 2017). One of the initiatives to improve micronutrient intake for women of reproductive age is increasing dietary diversity.

Assessment of dietary diversity

The diversity of household food groups over a reference period is a valuable proxy indicator for assessing dietary diversity (Hoddinott et al., 2002). A varied diet during pregnancy is associated with improved birth outcomes, such as higher birth weight, better child growth, and increased haemoglobin levels (Manjula et al., 2023; Amsalu et al., 2022; Zerfu, 2016; Awole, 2023). Several factors, including adequate caloric and protein intake, a higher proportion of animal-source protein (a high-quality protein source), and higher household income, are strongly linked to a more diverse diet (Manjula et al., 2023; Amsalu et al., 2022). Even in low-income households, additional income spent on food is correlated with increased diet quantity and quality (Manjula et al., 2023; Zerfu, 2016).

The Individual Dietary Diversity (IDD) indicators for women and children represent micronutrient adequacy or diet density. They are reliable markers of food's nutritional quality (FAO & FHI, 2016; Jef et al., 2015). Several indicators of food group diversity are currently in use or recommended for use at the population level (Table 1). Household and intrahousehold food security can be examined by asking questions about dietary diversity. The Household Dietary Diversity Score (HDDS) was initially created to assess household food security by evaluating the variety and quality of accessible food (Swindale & Bilinksy, 2006; FAO, 2011; Owais et al., 2016). Food access refers to a household's ability to obtain enough food of sufficient quality to meet its nutritional needs. The initial purpose of the score was to monitor and assess the impact of interventions on food access (Nyangasa et al., 2019; Hoddinot & Yohannes, 2002; Hatløy et al., 2000).

Dietary diversity is a measure of individual access to food, and the Dietary Diversity Score (DDS) for women and individuals (Kennedy et al., 2010) measures an individual's access to a variety of foods, one aspect of dietary quality (corresponding to micronutrient adequacy of the diet). The number of food groups consumed can be added to create a score for dietary diversity (Cheteni et al., 2020). The recommended amounts of various food groups are incorporated into both the Women's Dietary Diversity Score (WDDS) and the Household Dietary Diversity Score (HDDS) (FAO, 2011). Initially created to assess the likelihood of

micronutrient sufficiency in women of reproductive age, the WDDS now extends its application to individuals over two years old, known as the Individual Dietary Diversity Score (IDDS) (Swindale & Bilinsky, 2006; Gartaula et al., 2024).

Table 1. Food group diversity indicators currently in use or advocated for use at the population level

	The food group diversity indicators		
	Minimum Dietary Diversity-Women (MDD-W)	Minimum Dietary Diversity-Children (MDD-C)	Household Dietary Diversity-Score (HDDS)
Population sampled	Women aged 15-49 years (collected at the individual level & interpreted at the population level	Infants and young children aged 6-23 months	Households
Objectives	Reflects micronutrient adequacy, a crucial aspect of diet quality, in women's diets	Proxy for the adequacy of the micronutrient density of infant's diets Reflects one of several favourable IYCF practices	Reflects economic access to a diet with higher kilocalories per capita, a measure of household food security
Recall period	24 hours	24 hours	24 hours
Number of food groups	10	8 (including breastmilk)	12
Foods consumed outside the home	Included	Included	Excluded
Sources	FAO, 2021	Wafa et al., 2020 (International Dietary Data Expansion Project (INDDEX Project), 2020)	FAO, 2010

Source: Data collected and compiled by the researcher

According to the FAO model dietary diversity questionnaire, the ten food groups are part of the Minimum Dietary Diversity for women of reproductive age (MDD-W) indicator (FAO & FHI, 2016). As per the FAO dietary diversity questionnaire model, the ten specified food groups are integral to the Minimum Dietary Diversity for Women of Reproductive Age (MDD-W) indicator developed by FAO and FHI in 2016. The MDD-W questionnaire includes ten main food groups used to calculate the indicator, as well as six optional food groups and two mandatory food groups not factored into the final MDD-W score (FAO, 2016). The indicator aims to assess the dietary quality of individual women, but it is based on a single day's intake and does not account for the actual quantities of food consumed (FAO, 2016; FAO, 2021).

Open recall and list-based approaches are two primary methods used to assess food category diversity indicators (Gupta, 2016). The recall period collects information on a household's food intake, typically acquired by inquiring about the foods consumed within the last 24 hours (referred to as 24-hour recall) (Swindale & Bilinsky, 2006). The typical household activities were observed over a 24-hour period. In quantitative dietary recalls, participants are asked to estimate the approximate amounts of each food and ingredient consumed during a specific time

frame. This information is used to calculate calorie and protein intake and any deficiencies. On the other hand, the qualitative recall method focuses on capturing the current short-term diet. The MDD-W (FAO & FHI, 2016; Hanley et al., 2020) can be measured using a qualitative recall, and it does not require a quantitative recall. Since a single 24-hour recall cannot capture day-to-day differences in food frequency studies, food frequency questionnaires (FFQs) are necessary to estimate usual dietary intake patterns.

As per the Global Panel on Agriculture and Food Systems for Nutrition report (Scott, 2017; ICMR, 2019), consuming various foods from all food groups is crucial to maintaining good health (Archan et al., 2018). Dietary diversity is vital in ensuring individuals receive a broad spectrum of nutrients (Weerasekara et al., 2020; Uma & Sambuddha, 2021). When a person's diet lacks diversity, it may prevent them from getting all the nutrients they need, leading to nutrient deficiencies and a range of health problems (ICMR, 2019).

Study area

Thiruvananthapuram is a district located in the southern part of the Indian state of Kerala (Fig. 1) (Reghunathan & Anilkumar, 2014). It is also known as Trivandrum and is the capital of Kerala. The district has a population of 33,406,061; as of 2021, around 3.5 million people live there (Census of India, 2011). A province of southern India, it is bordered by the Arabian Sea in the west, the Western Ghats in the east, the Kollam district in the north, and the Tamil Nadu districts of Tirunelveli and Kanyakumari in the east and south, the district headquarters is in Thiruvananthapuram city. Thiruvananthapuram district is renowned for its rich cultural heritage and stunning natural beauty. Its economy is diversified, with substantial contributions from the service sector, including information technology, healthcare, and tourism. As per the 2011 Census of India, Thiruvananthapuram has a literacy rate of 96.2%, higher than the national average of 74.04%. The district has a high human development index (HDI) of 0.784, the highest in Kerala (Information and Public Relations Department, Kerala, 2018).

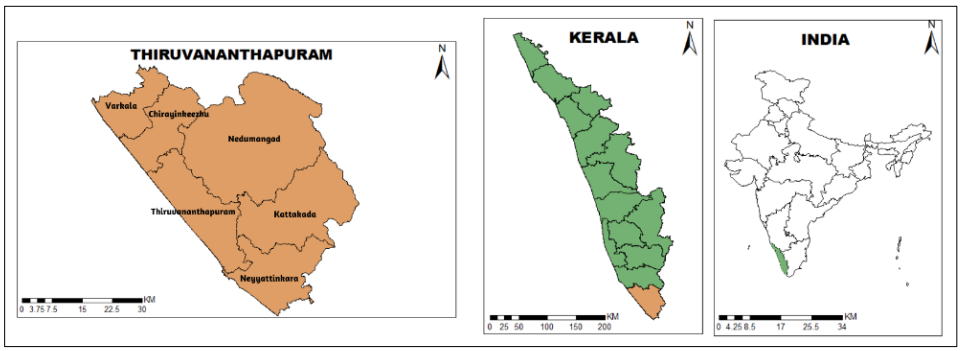

Figure 1. Location map of the study area

Source: Created by the researcher

Data and methodology

A stratified random sampling was used to reach the study participants for the primary survey from six Taluks in the Thiruvananthapuram district (Varkala,

Chirayinkeezhu, Nedumanagdu, Thiruvananthapuram, Kattakada and Neyyattinkara). The research included 384 females aged 18-40, with 64 households from each taluk. The sample size was distributed proportionally among the taluks, ensuring that each area was adequately represented in the study. A pre-tested, interviewer-administered questionnaire was used for the study. Based on the questionnaire, socio-economic and demographic information was gathered and documented, including age, type of location, educational status, occupational status, type of family, monthly income, and dietary diversity-related indicators. It was amended after a pilot study to suit the study objectives.

The participants were selected for the study based on specific inclusion criteria. These criteria stipulated that participant must be able to respond to the questionnaire and remember their diet from the preceding day. Individuals who were sick, bedridden, or, for some reason, unable to answer questions were excluded from the study. If more than one female in the household, based on the age limit criteria for the study, is eligible, but according to the person's wish, it was taken to participate in the study.

This study utilised a 24-hour dietary assessment method that involved participants recalling all food and beverage intake from the previous day before, including the time of consumption. Figure 2 provides a visual representation of a used methodology through a flowchart detailing the steps of the research process. Additionally, Figure 3 illustrates the tools used to create the food lists for the study. These figures visually demonstrate the process and tools employed in the study.

Prior to data collection, the principal investigator educated the participants about the ethical aspects of the study. Joining the research was optional, allowing individuals to decide whether to participate, and they gave consent before taking part in the study. Additionally, all completed questionnaires were manually reviewed and cleaned to ensure data accuracy and reliability. The questionnaire responses were coded and entered into Microsoft Excel 2019; afterward, the data was exported to IBM SPSS Statistics 22 for further analysis.

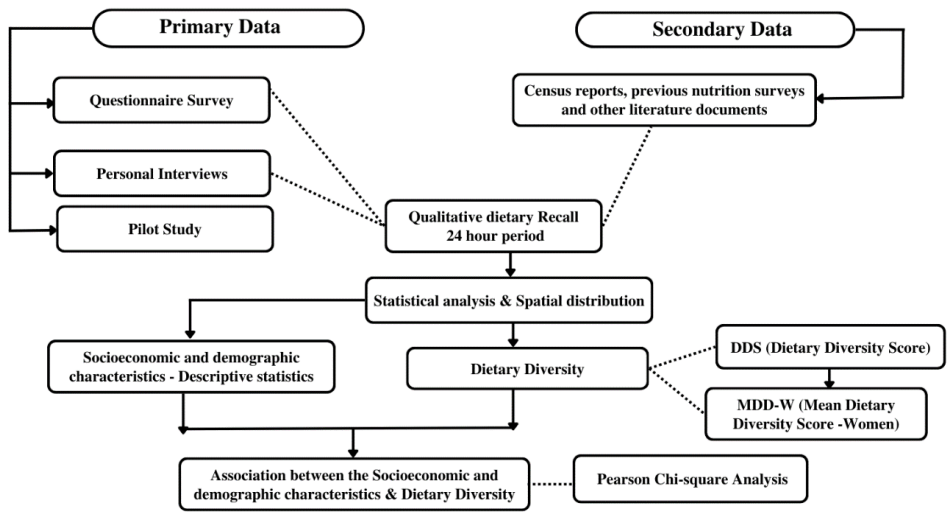

Figure 2. The flow chart of the study methodology

Source: Created by the researcher

This approach allowed for the organisation and analysis of the data to identify any potential patterns, relationships, or trends and to draw meaningful conclusions from the study. The data obtained from the 24-hour recalls was manually registered. Descriptive statistics were then employed to analyse the data and provide summary statistics to describe the characteristics of the food consumption patterns among the participants. As per the FAO guidelines, the MDD-W indicator includes ten distinct food categories (Table 2). Alternatively, it measures the number of food groups consumed in the past 24 hours (FAO, 2016). Each participant was allocated a score of one for each food group consumed during the specified period. Therefore, the maximum score an individual could obtain in this study was ten, indicating that they consumed all ten food groups.

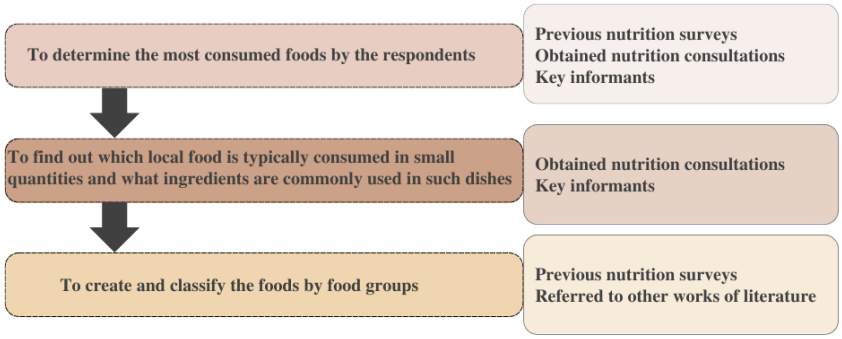

Figure 3. The steps involved in creating a comprehensive food list and the tools used

Source: Created by the researcher

Table 2. Food groups included in dietary diversity scores for women

No.	Food Groups
1	Grains, white roots and tubers, and plantains
2	Pulses (beans, peas, and lentils)
3	Condiments, tea, and coffee
4	Milk and milk products
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

Source: FAO 2010

The categorisation of the foods reported in the open-recall grid into appropriate food groups was done. This approach allows for the creation of an extensive food list based on the collected data. It is often used when there are constraints in terms of information and resources for developing a comprehensive food list prior to data collection or when enumerators may not have the specific expertise to classify food items into their respective groups correctly. The methods used as proxies for data collection include the questionnaire preparation, the food list length, the interview protocol, and the recording of responses (Figure 4). After the completion of data collection, the data profiling (Figure 5) stage was conducted. Data profiling is a process used to examine data and develop an understanding of its characteristics,

quality, and structure (Naumann, 2014). In this study, a data profiling protocol was employed to investigate the quality and characteristics of the collected data.

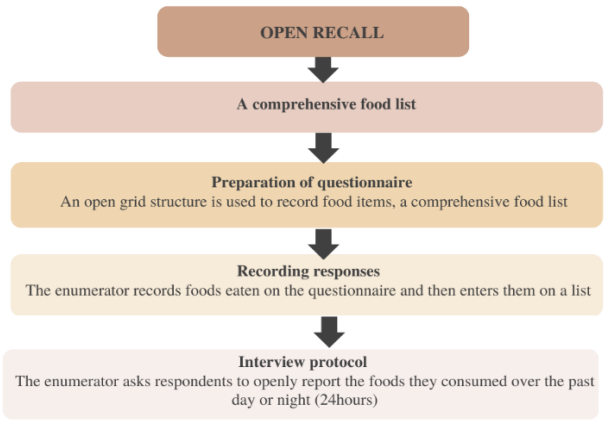

Figure 4. The method used for 24-hour open recall

Source: Created by the researcher

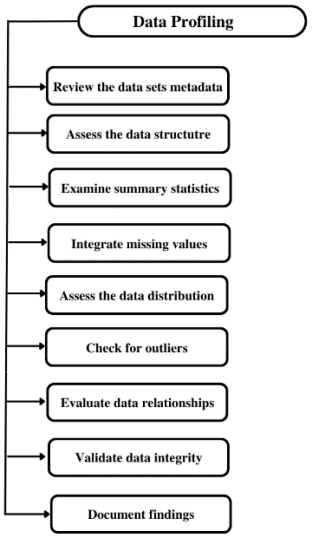

Figure 5. Data profiling

Source: Created by the researcher

Results and Discussion

Socio-economic and demographic characteristics of the participants in the study area

Societies' overall dietary habits are influenced by various socio-economic, demographic, physiological, psychological, and environmental factors (Morrison et al., 2011; Karunakaran, 2013; Karunakaran, 2014). In India, economic growth, urbanisation, and globalisation have resulted in diet diversification based on income (Pingali, 2012). Despite this dietary transition, the double burden of malnutrition continues to be a significant concern with undernutrition, widespread micronutrient deficiencies, and rising obesity (Retheesh, 2021). In comparison with other states in India, Kerala has pursued a unique development trajectory. Its focus on land reforms, education, healthcare, decentralisation, public distribution systems, and effective planning has reduced poverty.

Based on the socio-economic and demographic characteristics of the respondents, the following were identified: age, type of location, education status, marital status, work status, monthly income, and type of family (Table 3). This research utilises data generated from the researcher's cross-sectional, self-reported questionnaire. Specifically, the study analysed the relationship between socio-economic and demographic variables and Individual Dietary Diversity. It used descriptive statistics, like frequency and percentage, to understand these variables.

Most respondents were in the age group of 31-40 years (45.83%), 36.72% were aged 21-30 years, and the remaining respondents (17.44%) were 18-20 years of age. Nearly half (51.30%) of the respondents were from rural areas, followed by 25.52% from semi-urban areas, and the remaining 23.18% belonged to urban areas. As per educational level, over 50% cleared high school level, while about 1/3rd were

graduates. Nearly 80% of respondents were married, 16.40% were single, and 3.90% were divorced.

Table 3. Socio-economic and demographic characteristics of the participants (N=384)

Socio-economic and demographic Variables		N	%
Age (in years)	18-20	67	17.44
	21-30	141	36.72
	31-40	176	45.83
Type of location	Urban	89	23.18
	Semi-Urban	98	25.52
	Rural	197	51.30
Status of education	Uneducated	3	0.78
	High school	200	52.08
	Graduation	133	34.63
	Post-Graduation & above	48	12
Marital status	Single	63	16.40
	Married	306	79.68
	Divorced	15	3.90
Working status	Student	61	15.88
	Homemaker	208	54.16
	Government Job	29	7.55
	Private Job	83	21.61
	Self- employed	3	0.78
Type of family	Nuclear family	372	96.87
	Joint Family	12	3.12
Ration card categories	APL	201	52.34
	BPL	177	46.09
	Others	6	1.56
Monthly income	<10,000	182	47.39
	10,000 - 20,000	102	26.56
	21,000 - 30,000	71	18.48
	40,000 and above	29	7.55
Type of house	Two story houses	126	32.81
	Apartment	14	3.64
	Sheet	13	3.38
	Kucha house/slum	15	3.90

Source: Data collected and compiled by the researcher

The survey also considered the occupational background, wherein roughly half (54.16%) were homemakers. Around 52.34% of the respondents belonged to the APL category on the ration card, which was issued to households living above the poverty line. Around 46.09% of ration card holders fall under the Below Poverty Line (BPL) category, while 1.56% belong to other categories. Additionally, more than one-third of the study participants (47.39%) belong to the lower class with an income of less than ₹ 10,000. Out of the 384 people surveyed, a majority (94.79%) reported living with their family. A smaller percentage, 4.68%, reported living alone. The remaining 0.52% chose to stay with paying guests in cottages and hostels. In terms of family structure, 96.87% of the respondents reported living in a nuclear family, while 3.12% reported living in a joint family.

According to the survey, most house owners (56.25%) own a concrete house. The second most common type of house owned is a two-story house, accounting for 32.81% of the respondents. Kucha houses, which are typically made of mud, account for only 3.64% of the houses owned by the respondents. Additionally, 7%

of the respondents said they owned apartments or houses made of sheets, with an equal distribution between the two housing types. Regarding house ownership, most (89.06%) of respondents live in their own homes, and the rest live in rented houses (10.93%).

Dietary diversity among the participants in the study area

It is essential to consume a nutritious diet by choosing a variety of foods wisely. Diversified diets with judicious choices from various food groups provide the necessary nutrients. There are specific periods during which eating too little or too much food can be harmful, such as infancy, childhood, adolescence, pregnancy, and lactation. All nutrients must be consumed in an adequate diet during our lifetime (NIN, 2011). There has been a noticeable change in food habits in Kerala due to globalisation and urbanisation, and living standards have improved noticeably in recent years. In terms of economic stability and standard of living, it is also revealed that Kerala's dietary pattern is unique in India as it satisfies high-level food diversity and criteria for diet quality, regardless of income level. Despite this, declining food diversity among both high- and low-income groups is a worrying trend, which contradicts the conventional belief that income promotes wholesome eating habits.

In this study, we try to determine the proportion of women aged 18-40 years in the study area who consume diverse food items among the selected samples. A 24-hour recall method was used to obtain information on the food consumed the previous day, including ten food groups. The participant's food consumption from the previous day was scored based on the number of different food groups consumed, with a maximum score of 10. According to FAO guidelines, a score of 5 or more indicates good dietary diversity (FAO and FHI, 2016).

All the study participants had consumed some form of grain-based food the previous day. On a regular basis, pulses were the second most frequently consumed food group by women, right after cereals. The most widely seen food combination in many households in the study area is rice with sambar and dosa or idli with sambar. The other food groups consumed in decreasing order of consumption on the previous day were dark leafy vegetables, other vitamin A-rich fruits and vegetables, and other fruits. Other vitamin A-rich fruits and vegetables were consumed in adequate amounts by only 2.34% of the participants. The least consumed food group was dark green leafy vegetables, with only 1.30% of the study population having consumed it the previous day (Figure 6).

A DDS (Dietary Diversity Score) for each participant was calculated by giving a score of '1' for each of the ten food groups consumed. Based on the FAO dietary diversity model, the cut-off value of dietary diversity is '5'. The data shows that a significant majority, 85.67 per cent, have been classified as having adequate dietary diversity (with a score greater than 5), while a smaller proportion, 14.32 per cent, fall into the inadequate dietary diversity category (with a score less than 5). The distribution of adequate dietary diversity in Thiruvananthapuram, categorised by taluks, is illustrated in Tables 4 and Figure 7.

The classification of dietary diversity among the total participants in Thiruvananthapuram is divided into five distinct groups across various taluks (Table 5). A small percentage, specifically 0.26%, had low dietary diversity as they consumed only 1 to 2 food groups the day before, while in Varkala, one participant falls into this category. Additionally, 14.07 % had a moderately low dietary diversity level, the proportion of women in each taluk who consumed a moderately low variety of food groups the previous day; most individuals (71.35%) were in the moderate category, having a dietary diversity score ranging from 5 to 6. Finally, a

significant portion (14.32%) exhibited moderately high levels of dietary diversity with the consumption of 7 to 8 food varieties. This category indicates the proportion of women in each taluk who consumed a moderately high variety of food groups the previous day. Most of the taluks maintain a moderate dietary diversity.

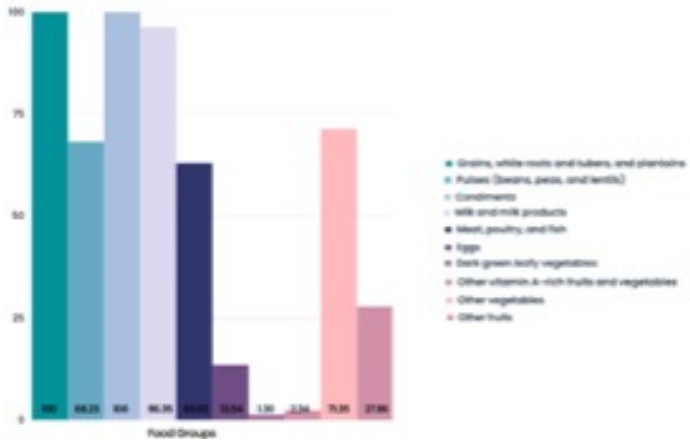

Figure 6. The proportion of women among the 384 study participants who had consumed a food item from each of the ten food groups the previous day based on a 24-hour recall

Source: Created by the researcher

Figure 7. The proportion of women having dietary diversity when above or below the threshold of five food groups (in percentage) a)Dietary Diversity Score <5 in the Taluks of Thiruvannathapuram district b) Dietary Diversity Score >5 in the Taluks of Thiruvannathapuram district

Source: Created by the researcher

Table 4. The taluk wise proportion of women participants having dietary diversity when above the threshold of five food groups

Taluks	<5 FG	%	>5 FG	%
Thiruvananthapuram	9	16.36	49	14.90
Neyyattinkara	8	14.54	67	20.36
Chirayinkeezhu	6	10.93	53	16.11
Kattakada	18	32.72	46	13.98
Nedumangadu	10	18.18	54	16.42
Varkala	4	7.27	60	18.23
Total	55	100	329	100

Source: Data collected and compiled by the researcher

Table 5. The proportion of women in each category when dietary diversity was classified into five groups based on the number of food groups consumed the previous day

Dietary Diversity (Number of food groups consumed)	Taluks						Thiruvananthapuram District (%)
	Thiruvananthapuram	Neyyattinkara	Chirayinkeezhu	Kattakada	Nedumangadu	Varkala	

Low (1-2)	0	0	0	0	0	1	1 (0.26)
Moderately low (3-4)	9	8	6	8	0	3	54 (14.07)
Moderate (5-6)	49	53	50	39	40	43	274 (71.35)
Moderately High (7-8)	16	8	8	8	8	7	55 (14.32)
High (9-10)	0	0	0	0	0	0	0

Source: Data collected and compiled by the researcher

It was found that the taluk with the largest dietary diversity is Thiruvananthapuram. This can be inferred from the counts in the "moderate" and "moderately high" categories, indicating a higher consumption of diverse food groups than the other taluks. Specifically, Thiruvananthapuram's counts in the "moderate" and "moderately high" categories are 49 and 16, respectively, which are relatively higher than the other taluks. This suggests that a larger proportion of women in Thiruvananthapuram taluk consumed a moderate to moderately high variety of food groups the previous day, indicating better dietary diversity in this taluk than the others. The data demonstrates that Thiruvananthapuram has a higher proportion of women consuming a more diverse range of food groups, which is often associated with better overall nutrition and health outcomes.

Association of socio-economic and demographic determinants with dietary diversity

Due to its relative simplicity and ability to reflect nutrient adequacy, dietary diversity has become increasingly popular over the last few years as a measure of health and nutrition. Links between socio-economic and demographic status and nutrition are also long established through dietary diversity (Rukhsana & Alam, 2021). Consuming a nutrient-dense diet has been linked to a low risk of all-cause mortality for a wide range of chronic diseases (Streppel et al., 2014; Shim et al., 2014). Unlike other lifestyle risk factors, dietary exposures are tough to quantify because all individuals eat food, even if the amount and type of food consumed vary between subjects, and people rarely perceive what they eat (Shim et al., 2014).

The MDD-W of the participants based on location was 329 (85.67%) out of 384 respondents (Fig. 8). More than half of the participants (51.07%) live in rural areas. 23.70 % were from urban areas, followed by 25.23 % from semi-urban areas.

Figure 8. Percentage of women under the age of 18-40 years achieving minimum dietary diversity during the previous day by the location of the participant

Source: Created by the researcher

In a 24-hour recall, the MDD-W total with location data shows that rural respondents tend to outnumber urban and semi-urban respondents regarding food group diversity scores.The consumption of grains, white roots, tubers, and plantains appears to be predominantly higher in rural areas (51.30%), followed by semi-urban areas (25.26%), and urban areas (23.44%). Rural respondents also exhibit a higher percentage of consumption of pulses, condiments, milk and milk products, meat, poultry, fish, eggs, other vegetables, and other fruits compared to their urban and semi-urban counterparts. It is worth noting that 80 % of both urban and rural respondents share an equal consumption of dark green leafy vegetables, while only 20 % consume other vitamin A-rich fruits and vegetables.

The study's findings suggest that several socio-economic and demographic factors were examined for the association with dietary diversity among women aged 18-40 in the Thiruvananthapuram district. Pearson's Chi-square analysis revealed that variables such as age groups, type of location, education status, marital status, occupation status, and type of family did not significantly affect dietary diversity (Table 6). However, an important finding was the significant association between monthly household income and dietary diversity, with a p-value of less than 0.05. This indicates that monthly household income may be crucial in determining dietary diversity among women in the study. Specifically, the study observed that the percentage of women with high dietary diversity was notably higher in the income range of ₹ 21,000 - 30,000 compared to other income ranges. These findings underscore the potential impact of socio-economic factors, particularly income, on dietary diversity among women in the study area.

Table 6. Association of socio-economic and demographic variables with dietary diversity among women under the age of 18-40 years

Variable	Category	Dietary Diversity						P Value
		Low	(%)	Medium	(%)	High	(%)	
Age	> 18-20	0	0	9	4.39	3	1.69	0.420
	21- 30	0	0	70	34.15	71	39.88	
	31- 40	1	100	126	61.46	104	58.43	
Type of location	Urban	0	0	46	22.44	43	24.16	0.893
	Semi-Urban	0	0	53	25.86	45	25.28	
	Rural	1	100	106	51.70	90	50.56	
Status of education	Uneducated	0	0	3	1.46	0	0	0.259
	High school	0	0	100	48.78	103	57.87	
	Graduation	1	100	77	37.56	53	29.77	
	Post-Graduation & above	0	0	25	12.20	22	12.36	
Marital status	Single	0	0	34	16.58	28	15.73	0.588
	Married	1	100	166	80.98	140	78.65	
	Divorced	0	0	5	2.44	10	5.62	
Occupation status	Student	0	0	27	13.17	32	17.97	0.384
	Homemaker	1	100	109	53.18	99	55.62	
	Government Job	0	0	17	8.29	12	6.74	
	Private Job	0	0	52	25.36	32	17.98	

	Self-employed	0	0	0	0	3	1.69	
Monthly Household Income	<10,000	0	0	80	39.02	102	57.30	0.002
	10,000 - 20,000	1	100	70	34.15	31	17.41	
	21,000 - 30,000	0	0	41	20	30	16.86	
	40,000 and above	0	0	14	6.83	15	8.43	
Type of family	Nuclear family	1	100	200	97.57	171	96.06	0.693
	Joint family	0	0	5	2.43	7	3.94	

Source: Data collected and compiled by the researcher

Conclusions

Dietary diversity refers to the variety of foods consumed within a certain period. Studies have shown that socio-economic and demographic factors, such as income level, education, and location, can impact dietary diversity. Individuals with higher income and education levels tend to have greater access to various nutritious foods, leading to a more diverse diet. Conversely, lower-income individuals may have limited access to healthy foods, resulting in a less diverse diet. The location also plays a role in dietary diversity. Urban areas tend to have a greater variety of food options, including fresh fruits and vegetables, than rural areas. Additionally, cultural and traditional food practices can influence dietary diversity. Research extensively explores how socio-economic and demographic factors relate to dietary diversity in diverse settings. Studies indicate that aspects like women's involvement in decision-making, financial status, educational background, and geographical location are linked to variations in dietary diversity. Socio-economic and demographic factors significantly impact an individual's dietary variety. There is a known concern regarding women's dietary patterns in their reproductive years. Still, a substantial push has not been made to tackle or enhance this matter through specific programmes or actions. This suggests a need for increased attention and measures to enhance the dietary standards of women. This data can provide valuable insights into the contextual aspects that affect the nutrition and overall health of the surveyed group.

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