

To study the frequency of fast food consumption among urban and rural adults of Varanasi district.

***Mrs.Priyanka**

Assistant Professor, Department of Home Science, Vasant Kanya Mahavidyalaya Kamachha, Varanasi. E-mail.id (priyankahscvkm@gmail.com)

****Prof.Archana Chakravarty**

Professor, Department of Home Science, Mahila Mahavidyalaya Banaras Hindu University, Varanasi, UP, India

ABSTRACT

Objective of the present research is to study the fast food consumption pattern of the urban and rural adults of Varanasi district. A community based cross sectional study was undertaken on 304 adults (Urban 152, Rural 152), 18-60 years of age group. A pretested and predesigned questionnaire was used to collect the information for the study. Socioeconomic and demographic information of study subject was assessed by interview technique. Frequency of fast food consumption was found to be significantly more in urban than rural subjects. With respect to fast food consumption, urban women are reported to have better access to a variety of food items.

INTRODUCTION

Due to economic development people have begun to shift from consumption of traditional foods towards the consumption of processed and refined foods. Information on the food consumption patterns in the general population will no doubt be a useful tool in formulating public health intervention against NCDs (Non –communicable diseases). In this study, it was concluded that the adult population maintained their traditional food habits which is high in roots and tubers, cereals and vegetables and consumed less of the foods considered to be less healthy such as fast food/pastries, chocolate, minerals, sugar and alcohol. However, the consumption of fruits which are considered to have potential health benefits was very low. The continued consumption of these traditional foods and avoidance of less health ones should be emphasised through health education while a surveillance team should be established by stakeholders to routinely monitor any changes

in their dietary habit for early intervention aimed at sustaining the healthy food consumption pattern.

India is known for its diversity in culture and believes, so also their eating behaviours are known to have different dietary habits. Food consumption of urban people have better due to access to a variety of food items. Rosse et al. (1996).

National Adult Nutrition Surveys (2011) it was indicated that participant were ranked the food choice motives based on importance to them when making their food selection – taste, cost (price), health and nutrition, convenience, feel good (mood) and weight control. Taste 41%, followed by health and nutrition 36% were considered the most important motives by the majority 77% of adults.

Andrew et al. (2013) studied the food consumption pattern of the urban and rural adult of Nigeria and observed that . A large proportion of respondents rarely or sometimes consumed soft drink, sweet/chocolate, tea or coffee with sugar and fast food/pastries. The intake of fast foods, noodles and pastries were higher in the urban than rural areas.

Present study is a baseline survey. Survey of the diet and nutritional status of the population is an important component of a public health approach to informing nutrition policy promoting healthy eating and reducing health problems. This is the comparative study of rural and urban adult population conducted with the objective of to study the frequency of fast food consumption among urban and rural adults of Varanasi district.

METHODOLOGY

STUDY DESIGN

A community based crosssectional design was adopted for this study.

STUDY SAMPLE

Male and female adults age group 18-60 were considered for this study.

SAMPLE SIZE

The determination of sample size is fixed considering 1:1 ratio between urban and rural adults, level of significance at 5% ($\alpha = 0.05$) and 80% of power of test ($1-\beta=0.80$) therefore after computing sample size come 304 which is decided into two equal part. Therefore 152 adults from rural as well as 152 adults from urban were selected.

SAMPLING METHODOLOGY

Varanasi district has been divided into 8 blocks (namely Cholapur, Chiraigaon, Kashi Vidyapeeth, Harahua, Baragaon, Pindra, Sivapur and Arazi Line) and 90 wards. Among 8 blocks Kashi Vidyapeeth block has been selected randomly and in 90 wards Nariya ward has been selected randomly. In Kashi Vidyapeeth block there are 122 villages and among these villages Susuwahi and Madhopur villages has been selected randomly. In Nariya ward, households of Saket Nagar, Bhogabeer & nearest households of Sankat Mochan were included in the study. Only one male or female adult was selected from each households alternatively.

TOOLS OF STUDY

Pretested and predesigned questionnaire was used for this study.

TECHNIQUE OF THE STUDY

The adults was personally informed the purpose of the study and their consent obtained prior to data collection. Information regarding fast food consumption of study subject was assessed by interview technique.

ANALYSIS OF DATA

Data thus generated was analysed with the help of Microsoft excel 2007 and SPSS version 16th software. Appropriate table were generated, statistical test χ^2 , F test, post hock and t, test applied.

RESULTS AND DISCUSSION**Table No. 1 : Region wise distribution of respondents about visiting to hotel or restaurant for taking food.**

Frequency of visit	Region				Total	
	Urban		Rural			
	No.	%	No.	%	No.	%
Weekly	17	11.2	02	1.3	19	6.2
Monthly	23	15.1	09	5.9	32	10.5
Sometimes	64	42.1	52	34.2	116	38.2
Never	48	31.6	89	58.6	137	45.1
Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 31.48, \quad df = 3, \quad p < 0.001^{***}$						

Out of 152 urban respondent, 48 (31.6%) never visited the hotel or restaurant for the purpose of taking food and 89 (58.6%) of rural respondents also reported the same, whereas only (11.2%) of urban and (1.3%) of rural were weekly visited the hotel or restaurant. The difference in proportion of frequency of visit to hotel or restaurant between urban and rural subject is obtained to be statistically highly significant may be due to non-availability of hotel or restaurant or low socioeconomic status in rural region.

Iza et al. (2014) found that there was a reduction of consumption of household's foods in urban area which requires longer preparation time and accessibility to a wider variety of food stuffs outside.

Table No. 2 : Distribution of respondents according to their area of residence and Family expenditure on food items.

Expenditure on food items	Region				Total	
	Urban		Rural			
	No.	%	No.	%	No.	%
≤ 2000	57	37.5	107	70.4	106	53.9
2000 - 4000	33	21.7	23	15.2	56	18.4

4000 – 6000	28	18.4	16	10.5	44	14.5
>6000	34	22.4	06	3.9	40	13.2
Total	152	100.0	152	100.0	304	100.0
Average Expenditure + SD	4407.24 +3364.35		2356.58 +2023.07		3381.91 +2955.53	
t = 6.44, df = 302, p < 0.001***						
Range = Rs.(1200 – 15000) /month						

In urban area the average family expenditure per month of the subjects was Rs. 4407.24 ± 3364.35 and it was Rs. 2356.58 ± 2023.07 per month in rural subjects on food items and this difference is found to be statistically highly significant between urban and rural region. Household income, food prices, food preferences, food availability, accessibility and seasonal variation and no. of family members influenced family food expenditure.

Table No. 3: Region wise distribution of subjects according to frequency of fast foods consumption.

Frequency of fast foods consumption	Region					
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
Daily	12	7.9	2	1.3	14	4.6
Weekly	25	16.4	6	3.9	31	10.2
Monthly	17	11.2	21	13.8	38	12.5
Sometimes	81	53.3	67	44.2	148	48.7
Never	17	11.2	56	36.8	73	24.0
Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 41.37, df = 4, p < 0.001***$						

In urban area more than half 53.3% of respondents were consuming fast foods sometimes (11.2%) monthly 16.4% weekly and only 7.9% daily whereas in rural area majority (44.2%) respondents were consuming fast food sometimes 13.8% monthly, 3.9% weekly and very less proportion 1.3% daily respectively. The difference in proportion of subjects in connection to frequency of fast food consumption between

urban and rural area is statistically highly significant because of urban people have better access to a variety of food items.

Andrew et al. (2013), the intake of noodles, fast foods and pastries were higher in urban than rural areas. About 37.8% in urban area consumed it at least four times in a week as against 36.1% in the rural areas, which is also somehow in higher proportion as compare to the present study might because of variation in socioeconomic status and regular food habit, and as well as their type of work engagement and lifestyle.

Prabhavathi et al. (2014) reported in study of Coimbtore city i.e. taste, convenience and alternate to home food were found to be major reasons for consuming fast food by the respondents. It was also reported that 45 per cent of the sample respondents were consumed fast food three times in a month, 34 per cent of them were consumed fast food for about once in a month and 13 per cent of the respondents consumed fast food occasionally. It is also observed that only 9 per cent of them consumed fast food, once in a week regularly. Study done by **Steyn and Marais (2010)** in South Africa showing that 11 per cent of the participants ate fast food daily, 27.6 per cent ate two to three times a week and 20.8 per cent ate fast food at least once a week. Only 3.8 per cent of the participants had fast food less than once per month.

CONCLUSIONS

It can be concluded that frequency of fast food consumption was found to be significantly more in urban than rural subjects. With respect to fast food consumption, urban women are reported to have better access to a variety of food items. India is known for its diversity in culture and believes. A large proportion of respondents rarely or sometimes consumed soft drink, sweet/chocolate, tea or coffee with sugar and fast food/pastries. The intake of fast foods, noodles and pastries were higher in the urban than rural areas.

REFERENCE

1. Rosse E, Prattala R, Lahelma E, Kleemola P, Modern and healthy : socioeconomic differences in the quality of diet. *European Journal of Clinical Nutrition*, 50 (3), 753-760, 1996.
2. Andrew A, Okechukwu, OM, Ugochukwu UO, Innocent IC, Moses A and Okechukwu SO, Food consumption pattern of adult population in Abia state, South East Nigeria, A community based survey, *Journal of Community Nutrition and Health*, 2(1), 84-91, 2013.
3. Iza, CVMX, Carla MH, Maria LSSA, and Mauro VGB, Frequency of consumption of fruits, vegetables and soft drink : a comparative study among adolescents in urban and rural areas, *Revista Brasileira de Epidemiology*, 17(2), 2014, (doi 10.1590/1809-45032014000020007 ENG)
4. Prabhavathi Y, Kishore NTK, & Kumar MR, Consumer preference and spending pattern in indian fast food industry, *Indian Journal of Science and Research Publication*, 4(2), 1-4, 2014.

To study the consumption pattern of fruits and vegetables among urban and rural adults of Varanasi district.

*Mrs.Priyanka

Assistant Professor, Department of Home Science, Vasant Kanya Mahavidyalaya Kamachha, Varanasi.

**Prof.Archana Chakravarty

Professor, Department of Home Science, Mahila Mahavidyalaya Banaras Hindu University, Varanasi, UP, India

ABSTRACT

Objective of the present research is to study the fruits and vegetables consumption pattern of the urban and rural adults of Varanasi district. A community based cross sectional study was undertaken on 304 adults (Urban 152, Rural 152), 18-60 years of age group. A pretested and predesigned questionnaire was used to collect the information for the study. Socioeconomic and demographic information of study subject was assessed by interview technique. Frequency of fruits and vegetables consumption was found to be significantly more in urban than rural subjects because of their higher economic condition. With respect to fruits and vegetables consumption, urban women are reported to have better access to a variety of fruits items.

INTRODUCTION

Food behaviour is influenced by a number of environmental and intra-individual factors, including motivations. The interplay between motivational factors and information processing is important for nutrition promoters as is the distinction between declarative and procedural knowledge. A brief survey of the recent literature shows that the evidence for the influence of nutrition knowledge on food behaviour is mixed. Nevertheless, recent works suggest that nutrition knowledge may play a small, but pivotal role in the adoption of health food habits.

Rasmussen et al. (2006) reported that a large body of epidemiological evidence suggests that a high fruits and vegetables help to promote health and to prevent chronic

diseases. In most developing countries, large population groups including children, adolescent and adults eat far less than the recommended amounts of fruits and vegetables.

This is the comparative study of rural and urban adult population conducted with the objective of consumption pattern of fruits and vegetables among urban and rural adults of Varanasi district. Majority of the studies has been conducted on adult considering a special group but in the present study general adult population is consider.

METHODOLOGY

STUDY DESIGN

A community based crosssectional design was adopted for this study.

STUDY SAMPLE

Male and female adults age group 18-60 were considered for this study.

SAMPLE SIZE

The determination of sample size is fixed considering 1:1 ratio between urban and rural adults, level of significance at 5% ($\alpha = 0.05$) and 80% of power of test $(1-\beta)=0.80$ therefore after computing sample size come 304 which is decided into two equal part. Therefore 152 adults from rural as well as 152 adults from urban were selected.

SAMPLING METHODOLOGY

Varanasi district has been divided into 8 blocks (namely Cholapur, Chiraigaon, Kashi Vidyapeeth, Harahua, Baragaon, Pindra, Sivapur and Arazi Line) and 90 wards. Among 8 blocks Kashi Vidyapeeth block has been selected randomly and in 90 wards Nariya ward has been selected randomly. In Kashi Vidyapeeth block there are 122 villages and among these villages Susuwahi and Madhopur villages has been selected randomly. In Nariya ward, households of Saket Nagar, Bhogabeer & nearest households of Sankat Mochan were included in the study. Only one male or female adult was selected from each households alternatively.

TOOLS OF STUDY

Pretested and predesigned questionnaire was used for this study.

TECHNIQUE OF THE STUDY

The adults was personally informed the purpose of the study and their consent obtained prior to data collection. Information regarding fruits and vegetables consumption of study subject was assessed by interview technique.

ANALYSIS OF DATA

Data thus generated was analysed with the help of Microsoft excel 2007 and SPSS version 16th software. Appropriate table were generated, statistical test χ^2 , F test, post hock and t, test applied.

RESULTS AND DISCUSSION

Table No. 1 : Distribution of respondents on the basis of their region and frequency of meal in day and night.

Frequency of meals	Region				Total	
	Urban		Rural		No.	%
	No.	%	No.	%		
Two times	75	49.3	101	66.5	176	57.9
Three times	72	47.4	47	30.9	119	39.1
Four times	05	3.3	04	2.6	09	3.0
Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 9.21, \quad df = 2, \quad p < 0.01^{**}$						

The above table shows that majority 49.3% of respondents belongs to urban area were having to take their meals two times followed by 47.4% three times in day and night only, where as in rural area maximum 66.5% and 30.9% of respondents were in habit of taking their meal two times and three times during the 24 hours of period respectively. The difference in proportion about frequency of taking meals between the respondents of urban and rural region is found to be statistically highly significant.

Kumari & Singh (2002) found that tradition of preparing food only twice a day was prominent in rural areas due to which maximum adults of rural areas take meal two times in 24 hours.

Table No. 2. Distribution of urban and rural respondents on the basis of consumption of food pattern.

Food consumption Pattern	Region				Total	
	Urban		Rural			
	No.	%	No.	%	No.	%
Vegetarian	82	53.9	71	46.7	153	50.3
Non-Vegetarian	63	41.4	78	51.3	141	46.4
Vegetarian	07	4.7	03	2.0	10	3.3
Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 3.99, df = 2, p > 0.05$ (NS)						

Out of total selected respondents more than half 50.3% were vegetarian out of which the proportion of urban respondents (53.9%) was more as compare to rural respondent (46.7%) whereas an opposite trend is observed in case of non-vegetarian habits i.e. more (51.3%) in the respondents of rural area than urban area but the difference is not statistically significant. **Bhanot and Chauhan (2003)** studied on women of Sultanpur district reported that maximum respondents were vegetarian and a less no. of women were non-vegetarian. Religion and also low purchasing power of people were the major factors for being vegetarian.

Table No. 3 : Region wise distribution of respondents according to amount of liquid (water + others) intake/day.

Liquid intake/ day (in liter)	Region				Total	
	Urban		Rural			
	No.	%	No.	%	No.	%
1 – 3	56	36.8	69	45.4	125	41.1
4 – 6	77	50.7	78	51.3	155	51.0
> 6	19	12.5	05	3.3	24	7.9

Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 9.53, \quad df = 2, \quad p < 0.01^{**}$						
Average Liquid intake/day \pm SD	4.62 ± 2.08		3.74 ± 1.44		4.18 ± 1.84	
$t = 4.29, \quad df = 302, \quad p < 0.001^{***}$						
Range = (1 – 12)						

It is depicted that majority 50.7% of urban subjects and 51.3% of rural subjects reported to take liquid per day in the range of 4-6 litre whereas more than 6 litre liquid intake per day were admitted by only in minimum proportion 12.5% by urban and 3.3% by rural subjects respectively. The average liquid intake per day was 4.62 ± 2.08 litre and 3.74 ± 1.44 litre was in urban and rural subject respectively and this difference is highly significant. Measurement of liquid was decided to observe the capacity of pots/glass. It may more than 6 liters in respondents as besides water, other liquid such as fruit juices, beverage, milk, coffee and tea were also included.

The liquid per day was more in urban than rural respondents may be due to awareness about importance of liquid intake among urban adults or it may be due to the reason that they reported higher intake of milk, juices and other beverages liquid at the day of survey.

A large population-based cohort study (11,746 population, male 5042, female 6704) in Araihasar, Bangladesh was done by **Ahsan et al. (2006)** where the maximum daily water consumption was 9.2 Llitre for male and 8.7 litre for female. **Hossain et al. (2013)** studied water intake involving 423 individuals from villages of West-Bengal, India and reported Average daily direct water intake was recorded as high as 9.17 litre by an agricultural labour from Golabari Chandpur. In these studies only direct water intake has been studied but in the present study (both direct+indirect) intake as beverages, milk and tea was also included which exceed the water intake level by adults.

Table No.4: Distribution of respondents according to consumption of different types of vegetables in their foods with place of residence.

Types of vegetable	Region					
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
Green vegetables	62	40.8	36	23.7	98	32.2
Root & Tubers	19	12.5	19	12.5	38	12.5
Both	71	46.7	97	63.8	168	55.3
Total	152	100.0	152	100.0	304	100.0
$\chi^2 = 10.92, \text{ df} = 2, \text{ p} < 0.01^{**}$						

It is depicted from the above table that maximum (46.7%) of urban adults and 63.8% of rural adults were consuming green vegetables along with roots and tubers while only consumption of green vegetables in their food was reported by (40.8%) and (23.7%) of urban and rural adults respectively and this difference in percentage between urban and rural is found to be statistically highly significant. All the respondents were in habit to use green vegetables and roots & tubers in their food habits in regular or irregular way. Consumption of leafy vegetables is higher in rural population as it not so costly and easily available in their fields at different season, but in urban population people are attracted toward increasing the consumption of green leafy vegetables because it is good source of vitamins and minerals which prevent the diseases.

Table No.5: Region wise distribution of subjects according to type of fruit consumption.

Type of fruits	Region				Total	
	Urban (152)		Rural (152)		(304)	
	No.	%	No.	%	No.	%
Sweet fruit	40	26.3	61	40.1	101	33.2
Juicy fruit	7	4.6	9	5.9	16	5.3
Sweets & sour both	32	21.1	19	12.5	51	16.8

All type of seasonal fruits	73	48.0	63	41.4	136	44.7
$\chi^2 = 8.67, \quad df = 3, \quad p < 0.05^*$						

It is noted that majority 48.0% of urban adults and 41.4% of rural adults were reported all types of seasonal fruits along with their meal, while intake of sweet fruits were found to be in 26.3% and 40.1% of urban and rural adults and the difference in proportion according to the intake of fruits type is statistically significant may be due to availability, affordability, access and awareness about the importance of fruit intake among urban adults. Sweet fruits (banana, apple, date, fig, papaya eg.) sour fruits (strawberry, tomato, cherry, pineapple) and juicy fruits (orange, grapes, mango, lime, pomegranate) were described at the time of survey.

Table No.6: Region wise distribution of subjects according to consumption of Salads

Type of fruits	Region				Total (304)	
	Urban (152)		Rural (152)		No.	%
	No.	%	No.	%		
Sweet fruit	79	52.0		40.1	101	33.2
Juicy fruit	7	4.6	9	5.9	16	5.3
Sweets & sour both	32	21.1	19	12.5	51	16.8
All type of seasonal fruits	73	48.0	63	41.4	136	44.7

Salads						
Daily	79	52.0	74	48.7	153	50.3
Sometimes	71	46.7	46	30.2	117	38.5
Never	2	1.3	32	21.1	34	11.2
$\chi^2 = 31.98, \quad df = 2, \quad p < 0.001^{***}$						

The proportion of using salads in daily diets the proportion of rural respondents were low might because of lack of awareness about fibre rich foods. statistical χ^2 test shows that the frequency of using of various type of study food materials between urban

and rural respondents is highly significant. Poverty and lack of purchasing power have been identified as the major factors responsible for the low dietary intake in rural area.

Table No.7 : Region wise distribution of respondents according to consumption of different types of vegetables as salads in their food.

Types of salad	Region					
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
Seasonal Vegetable	36	24.0	20	16.7	56	20.8
Onion/ Tomato Lemon etc.	26	17.3	20	16.7	46	17.0
Both	88	50.7	80	66.6	168	62.2
Total	150	100.0	120	100.0	270	100.0
$\chi^2 = 2.43, \text{ df} = 2, \text{ p} > 0.05(\text{NS})$						

The respondents who were consuming different types of vegetable as salad in their foods majority (50.7%) of urban area and (66.6%) of rural region were in habit to consume both type of salad as seasonal vegetable and onion / tomato/ lemon in their food, but statistically this difference between the subjects of urban and rural area is not significant. The consumption of seasonal vegetables was in lower proportion in rural area may be due to non availability of seasonal vegetables throughout the year and unaffordable cost both. They consume seasonal vegetables only available in their fields in different seasons.

CONCLUSIONS

It is also seen that the proportion of using green vegetables, roots and tubers are significantly more in rural adults than urban whereas intake of fruits daily as well as seasonally are significantly more in rural adults. There are significant difference between

urban and rural subjects regarding consumption of fruits, in the present study area. It is also seen that the proportion of using green vegetables, roots and tubers are significantly more in rural adults than urban whereas intake of fruits daily as well as seasonally are significantly more in rural adults.

REFERENCES

1. Rasmussen M, Krolner R, Klepp KI, Lyte L, Brug J, Bere A, Due P, Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies, *International Journal of Behavioral Nutrition and Physical Activity*, 3, 22- 27, 2006, doi:10.1186/1479-5868-3-22.
2. Kumari R, and Dahiya S, studies on socioeconomics, personal, and family profile along with food habits of patient with kidney stones, *The Indian Journal of Nutrition and Dietetics*, 36, 479-483, 1999.
3. Bhanot S, and Chauhan G, Dietary profile of women in a village of Esaern UP, *The Indian Journal of Nutrition and Dietetics*, 40, 455-461, 2003.
4. Ahsan H, Chen Y, Parvz F, Argos M, Hussain AZMI, Momotaj H, et al. Health effects of arsenic longitudinal study (HEALS): Description of a multidisciplinary epidemiologic investigation. *Journal of Experimental Science, Environment and Epidemiology*,16,191–205,2006.
5. Hossain MA, Rahman MM, Murrill M, Das B, Roy B, Dey S, Maity D, and Chakraborti D, Water consumption patterns and factors contributing to water consumption in arsenic affected population of rural West Bengal, India, *Journal of Science and Total Environment*,1, 1217-1224,2014.



ISSN: 2395-7476

IJHS 2024; 10(2): 90-92

© 2024 IJHS

www.homesciencejournal.com

Received: 10-02-2024

Accepted: 16-03-2024

Jahnvi Sharma

Department of Home Science,
Vasant Kanya Mahavidyalaya,
BHU, Varanasi, Uttar Pradesh,
India

Dr. Priyanka Kumari

Department of Home Science,
Vasant Kanya Mahavidyalaya,
BHU, Varanasi, Uttar Pradesh,
India

Dr. Ajai Kumar Pandey

Department of Kayachikitsa,
Ayurveda, IMS, BHU, Varanasi,
Uttar Pradesh, India

Corresponding Author:

Jahnvi Sharma

Department of Home Science,
Vasant Kanya Mahavidyalaya,
BHU, Varanasi, Uttar Pradesh,
India

Prevalence of vitamin B12 deficiency in type 2 diabetic patients: A review

Jahnvi Sharma, Dr. Priyanka Kumari and Dr. Ajai Kumar Pandey

DOI: <https://doi.org/10.22271/23957476.2024.v10.i2b.1605>

Abstract

Vitamin B₁₂ also named as Cobalamin, is a water-soluble vitamin. It acts fundamental role in Neurological function, Optimal Haemopoiesis and DNA Synthesis. The deficiency of Vitamin B₁₂ features as the haematological and neuro cognitive dysfunction. Diabetic patients have been demonstrated highly prevalent of Vitamin B₁₂ deficiency. The purpose of the current study to review the literature related to the prevalence of Vitamin B₁₂ deficiency in type 2 diabetic patients. The studies assess that the prevalence of Vitamin B₁₂ deficiency is ranges about 5.8 to 52% in diabetic patients. Such as the study of D. Malla *et al* reported as high as 50.95% prevalence of Vitamin B₁₂ deficiency in diabetic patients. However, the patients enrolled in the study are on metformin treatment. Several Studies reported that the deficiency of Vitamin B₁₂ may associated with the treatment of Metformin and old age population. Metformin is known as the initial hypoglycaemic drug to treat Type 2 Diabetes Mellitus. It prescribed by many health practitioners as front-line treatment for T₂DM. It is used as monotherapy or combined with other drugs according to the need with some of the mild or self-limiting side effect of the drug. However, studies reported that the prevalence of vitamin B₁₂ deficiency is highly associated with dose and duration of metformin treatment in diabetic patients. Old age population may associate due to the low absorption capacity of the micronutrient in that period of lifecycle. The deficiency of vitamin B₁₂ leads to various complication related to peripheral neuropathy which diagnose as diabetic neuropathy. The literature indicates the necessity of screening status of serum Vitamin B₁₂ in patient of diabetes regularly will help to be aware.

Keywords: Vitamin B12, diabetes mellitus, metformin, old age, diabetic neuropathy

Introduction

Diabetes is one of the globally known chronic disease that affects people wellbeing. It can be classified in type 1, type 2, Gestational Diabetes, and MODY. The major driver of epidemic of Diabetes are the Type 2 Diabetes Mellitus, which have 90% of all diabetic cases. Type 2 are insulin dependent Diabetes mellitus. It generally occurs due to inactive lifestyle, stress, overweight, and obesity. The prevalence of diabetes patients in 20-79 age group in India is about 74.2 million in 2021 said Mansukh Mandaviya, Union Minister of Health and Family Welfare to the Lok Sabha December 3, 2021. The uncontrolled diabetes can lead to many acute and chronic complications. Research studies indicates that the Vitamin B₁₂ deficiency is a potential comorbidity in the diabetic patients. Studies found that the prevalence of vitamin B₁₂ deficiency in diabetic patients has been higher than normal population. (A. Satyanarayana *et al*, 2011) ^[28].

Vitamin B₁₂ also named as Cobalamin, is a water-soluble vitamin important for various biological functions in the eukaryotes. Vitamin B₁₂ acts as neurotrophic factor which have the fundamental role in Neurological function, Optimal Haemopoiesis, DNA Synthesis and participating to functional restorations. (Rana Ali Hamdi, 2021) ^[25] There are two main function of vitamin B₁₂ appears to have in eukaryotes: act as cofactor for the methyl-malonyl-CoA mutase and methionine synthase enzyme. Methyl-malonyl-CoA mutase requires Vitamin B₁₂ in a step of catabolism of ketogenic amino acid and in the odd chain fatty acids oxidation. Vitamin B₁₂ requires in the form of 5-deoxyadenosyl cobalamin for the conversion of mitochondrial enzyme Methyl-malonyl-CoA mutase in the succinyl-CoA. As methionine formation is essential for the hundred methylation process.

(Rétey, 1982) [27] Methionine synthase catalyses the conversion of homocysteine by the transfer of Methyl group from Methyl-tetrahydrofolate into Methionine with the help of vitamin B12 in the form of Methyl-cobalamin (Allen, 2012) [2]. These functions are very crucial for human health. The dietary requirement for normal human health is 2.2µg/day for an adult Male/Female (Acc. To ICMR, RDA, 2020).

Vitamin B₁₂ deficiency can lead to various complications in the body. The main features of vitamin B₁₂ deficiency are the haematological and neuro cognitive dysfunction. Vitamin B₁₂ deficiency is a major issue for diabetic patients, especially for the old age population and those on metformin treatment. The long-term duration of the treatment and the high drug dose affect the serum level of vitamin B12 in diabetic patients due to the malabsorption of the micronutrient. Ting *et al.* shown that long-term metformin treatment results in malabsorption of vitamin B12, resulting in a roughly 30% decrease in vitamin B12 levels.

The current study has the aim to review the literature related to the topic and identify the studies reported about the prevalence of Vitamin B₁₂ in Diabetic Patients.

Prevalence of Vitamin B₁₂ Deficiency in Diabetic Patients

Vitamin B12 deficiency is a well-known health issue, it does not appear to have received the same attention as deficiencies in other micronutrients like iron, calcium or vitamin D. Vitamin B12 have many dominant roles in the different biological process in the body. It has the potential to be useful as antioxidants, act as neurotropic factor and also play an important role in the utilization of carbohydrates due to which the deficiency of the micronutrient increases the risk of hyperglycaemia. In the study of Chow *et al* reported that Vitamin B-12 is beneficial for the management of glucose because in a vitro-investigations have shown that animal's deficiency in the vitamin B₁₂ had reduced levels of glutathione and enzyme activity. (FB Chow *et al*, 1957) [9].

The study of vitamin B12 deficiency in diabetic patients has been a subject of investigation, with many studies demonstrating an association of vitamin B12 deficiency in type 2 diabetes mellitus. Several studies metabolically confirmed that the high prevalence of Vitamin B₁₂ deficiency in diabetes Mellitus. The studies assess the prevalence of Vitamin B₁₂ Deficiency to range from 5.8% to 52%. (Ahmed *et al.*, 2016) [1] Such as the study of D. Malla *et al* reported as high as 50.95% prevalence of Vitamin B12 deficiency in T2DM patients. However, the patients enrolled in the study are on metformin treatment. Furthermore, a study of Pflipsen *et al.* concluded that 22% prevalence of vitamin B12 deficiency in diabetic patients. As per the study's findings, 86.4% of patients are receiving metformin medication and the majority of responders are elders. Additionally, the study suggests that patients with the deficiencies have the medical history of long-term disease. The association of vitamin B₁₂ deficiency with diabetes is highlighted in several studies and most of the studies concluded that long term metformin treated patients are more prevalent to the micronutrient deficiency. It is beyond dispute that the primary factor linked to vitamin B12 deficiency in patients with type 2 diabetes is the use of metformin treatment. Metformin is known as the initial hypoglycaemic drug to treat Type 2 Diabetes Mellitus. It prescribed by many health practitioners as front-line treatment for T₂DM. It is used as monotherapy or combined with other drugs according to the need with some of the mild or self-limiting side effect of the drug. Old age population

may associate due to the low absorption capacity of the micronutrient in that period of lifecycle.

Vitamin B12 deficiency is considered a potential comorbidity that is often ignored, putting many diabetic people at risk for developing particular conditions. (Pflipsen *et al.*, 2009) [22] Many studies have documented that Vitamin B12 deficiency highly prevalent in diabetic patients especially with neuropathy. Diabetic neuropathy refers to a range of nerve damage conditions associated with diabetes mellitus. Around 30% of diabetic individuals over forty years of age report experiencing neuropathy, a relative health problem caused by a vitamin B12 shortage that manifests as decreased sensory sensitivity in the feet. (National Diabetes Statistic Report, Aug 2017) The symptoms of diabetic neuropathy are similar to those of ataxia, paraesthesia, impaired coordination, and proprioception, which has been connected to a vitamin B12 deficit. (Lindenbaum J *et al*, 1988) [19] According to Alvarez *et al.*, the prevalence of vitamin B12 deficiency in diabetic patient with neuropathy is 17%. They discovered an inverse correlation between vitamin B12 levels and diabetic neuropathy. The study also found that the relationship between lower vitamin B12 levels and male sex characteristics and metformin dosage. (Alvarez *et al*, 2019) [4] This study found significance difference in men compared to women. However, a study concluded that the high prevalence of the micronutrient in women (Alharbi *et al*). Vitamin B12 insufficiency was not shown to differ based on gender in the majority of studies. Moreover, the reviewed literatures indicates that the Type 2 Diabetes Mellitus were significantly associated with increased risk of vitamin B12 deficiency. Thus, further information about the prevalence and correlation of vitamin B12 insufficiency risk in diabetic patients is provided by this review.

Conclusion

Several studies have evidence that the vitamin B12 deficiency highly prevalent in diabetic patients with neuropathy and high risk of the deficiency induced by metformin therapy. Many studies also reported that old age factor related to lower the vitamin B12 level in diabetic patients. So, the regular screening of vitamin B12 in diabetic patients is necessary to monitor the micronutrient level in blood particularly with diabetic neuropathy patients and those on long duration and high dose of metformin treatment. It is recommended that healthcare professionals remain cognizant of these adverse effects at all times. Annual screening was generally recommended in most of the reviewed papers. Additionally, multivitamin empirical medication should be investigated as a means of lowering the incidence of lowering the micronutrient level.

Reference

1. Ahmed MA, Muntingh G, Rheeder P. Vitamin B12 deficiency in metformin-treated type-2 diabetes patients, prevalence and association with peripheral neuropathy. *BMC Pharmacol Toxicol.* 2016;17(1):1-10. <https://doi.org/10.1186/s40360-016-0088-3>
2. Allen LH. Vitamin B-12. *Adv Nutr.* 2012;54-55.
3. Almatrafi SB, Bakr ESH, Almatrafi AA, Altayeb MM. Prevalence of vitamin B12 deficiency and its association with metformin-treated type 2 diabetic patients: A cross sectional study. *Hum Nutr Metab.* 2022;27:200138. <https://doi.org/10.1016/j.hnm.2022.200138>
4. Alvarez M, Sierra OR, Saavedra G, Moreno S. Vitamin B12 deficiency and diabetic neuropathy in patients taking

- metformin: A cross-sectional study. *Endocr Connect.* 2019;8(10):1324-1329.
5. Al Zoubi MS, Al Kreasha R, Aqel S, Saeed A, Al-Qudimat AR, Al-Zoubi RM. Vitamin B12 deficiency in diabetic patients treated with metformin: A narrative review. *Ir J Med Sci.* 2024. <https://doi.org/10.1007/s11845-024-03634-4>
 6. Anil Kumar R, Surekha B, Shetty, Lalitha R. Prevalence of vitamin B12 deficiency in Indian type 2 diabetes subjects on metformin therapy. *Int J Med Res Rev.* 2017;5(09):845-850.
 7. Beulens JW, Hart HE, Kuijs R, Kooijman-Buiting AM, Rutten GE. Influence of duration and dose of metformin on cobalamin deficiency in type 2 diabetes patients using metformin. *Acta Diabetol.* 2014;52(1):47-53. doi: 10.1007/s00592-014-0597-8.
 8. Centers for Disease Control and Prevention: National Diabetes Statistics Report: Estimates of Diabetes and its Burden in the United States. Centers for Disease Control and Prevention; c2017.
 9. Chow BF, Stone HH. The relationship of vitamin B12 to carbohydrate metabolism and diabetes mellitus. *Am J Clin Nutr.* 1957;5:431-439.
 10. Malla D, Bajracharya MR, Karki BB, Rajouria AD, Shrestha PS. Prevalence of Vitamin B12 Deficiency in Patients With Type II Diabetes Mellitus On Metformin. *J Diab Endocr Assoc Nepal.* 2021;5(1):39-43.
 11. DeFronzo RA, Goodman AM. Efficacy of metformin in patients with non-insulin-dependent diabetes mellitus. *N Engl J Med.* 1995;333:541-549.
 12. de Jager J, Kooy A, Lehert P, Wulffele MG, van der Kolk J, Bets D, *et al.* Long term treatment with metformin in patients with type 2 diabetes and risk of vitamin B12 deficiency: randomised placebo controlled trial. *BMJ.* 2010;340.
 13. Ting RZ-W, Szeto CC, Chan MH-M, Ma KK, Chow KM. Risk factors of vitamin B12 deficiency in patients receiving metformin. *Archives of Internal Medicine.* 2006;166:1975-1977.
 14. Filioussi K, Bonovas S, Katsaros T. Should we screen diabetic patients using biguanides for megaloblastic anaemia? *Aust Fam Physician.* 2003;32:383-384.
 15. Hamdi RA. A review on vitamin B12 and diabetic neuropathy. *Iraqi Postgrad Med J.* 2021;20(2).
 16. Hermann LS, Nilsson B, Wettre S. Vitamin B12 status of patients treated with metformin: a cross-sectional cohort study. *Br J Diabetes Vasc Dis.* 2004;4:401-406.
 17. Krishnan GD, Zakaria MH, Yahaya N. Prevalence of vitamin b12 deficiency and its associated factors among patients with type 2 diabetes mellitus on metformin from a district in Malaysia. *J ASEAN Fed Endocr Soc.* 2020;35(2):163-168. <https://doi.org/10.15605/jafes.035.02.03>
 18. Lee YJ, Wang MY, Lin MC, Lin PT. Associations between Vitamin B-12 Status and Oxidative Stress and Inflammation in Diabetic Vegetarians and Omnivores. *Nutrients.* 2016;8(3):118.
 19. Lindenbaum J, Healton EB, Savage DG, Brust JC, Garrett TJ, Podell ER, *et al.* neuropsychiatric disorders caused by cobalamin deficiency in the absence of anemia or macrocytosis. *N Engl J Med.* 1988;318:1720-1728.
 20. Malla D, Bajracharya MR, Karki BB, Rajouria AD, Shrestha PS. Prevalence of Vitamin B12 Deficiency In Patients With Type II Diabetes Mellitus On Metformin. *J Diabetes Endocrinol Assoc Nepal.* 2021;5(1):39-43. <https://doi.org/10.3126/jdean.v5i1.38916>
 21. Oh R, Brown D. Vitamin B12 deficiency. *American Family Physician.* 2003;67:979-986.
 22. Pflipsen MC, Oh RC, Saguil A, Seehusen DA, Topolski R. The prevalence of vitamin B12 deficiency in patients with type 2 diabetes: A cross-sectional study. *Journal of the American Board of Family Medicine.* 2009;22(5):528-534. <https://doi.org/10.3122/jabfm.2009.05.090044>.
 23. Pongchaidecha M, Srikusalankul V, Chattananon A, Tanjariyaporn S. Effect of metformin on plasma homocysteine, vitamin B12 and folic acid: a cross-sectional study in patients with type 2 diabetes mellitus. *Journal of the Medical Association of Thailand.* 2004;87:780-787.
 24. Qureshi S, Ainsworth A, Winocour P. Metformin therapy and assessment for vitamin B12 deficiency: is it necessary? *Practical Diabetes.* 2011;28:302-304.
 25. Hamdi RA. A review on vitamin B12 and diabetic neuropathy. *The Iraqi Postgraduate Medical Journal.* 2021;20(2):99-101.
 26. Reinstatler L, Qi Y, Williamson R, Garn J, Oakley G Jr. Association of biochemical B12 deficiency with metformin therapy and vitamin B12 supplements. *The National Health and Nutrition Examination Survey. Diabetes Care.* 2012;35:327-333.
 27. Rétey J. Chapter 6: Vitamin B12: Stereochemical aspects of its biological functions and of its biosynthesis. In: Tamm C, editor. *Stereochemistry.* Vol. 3. Elsevier; 1982. p. 249-282. [https://doi.org/10.1016/S0167-7306\(08\)60397-X](https://doi.org/10.1016/S0167-7306(08)60397-X).
 28. Satyanarayana A, Balakrishna N, Pitla S, Reddy PY, Mudili S, Lopamudra P, Suryanarayana P, Viswanath K, Ayyagari R, Reddy GB. Status of B-vitamins and homocysteine in diabetic retinopathy: association with vitamin-B12 deficiency and hyperhomocysteinemia. *PLoS One.* 2011;6(11).
 29. Shahwan M, Hassan N, Noshi A, Banu N. Prevalence and risk factors of vitamin B12 deficiency among patients with type II diabetes on metformin: A study from northern region of United Arab Emirates. *Asian Journal of Pharmaceutical and Clinical Research.* 2018;11(8):225-229.
 30. Smith AD, Warren MJ, Refsum H. Chapter Six - Vitamin B12. In: Eskin NAM, editor. *New Research and Developments of Water-Soluble Vitamins.* Vol. 83. Academic Press; c2018. p. 215-279.
 31. Swidan AK, Ahmed MAS. Should we follow the guidelines on vitamin B12 deficiency and diabetes? A retrospective analysis of data from Middle Eastern population. *Alexandria Journal of Medicine.* 2023;59(1):36-41. <https://doi.org/10.1080/20905068.2023.2209410>.