ADHERENCE TO ESSENTIAL NUTRITIONAL AND LIFESTYLE PRACTICES AMONG THE RESIDENTS OF URBAN AND RURAL SETTINGS DURING COVID-19 AT JASHORE DISTRICT IN BANGLADESH

Bioresearch Communications
Volume 10, Issue 2, July 2024

DOI: doi.org/10.3329/brc.v10i2.74579

Eyad Ahmed[1*], Sabrina Zaman[2], Israt Jahan[3], Humaira Sadia[4], Rakibul Islam[2], Razia Sultana[2] and Obeydul Islam[2]

[1]Institute of Nutrition and Food Science, University of Dhaka, Dhaka-1000, Bangladesh
[2]Department of Nutrition and Food Technology, Jashore University of Science and Technology, Jashore-7408, Bangladesh
[3]Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Noakhali, Bangladesh
[4]Department of Public Health Nutrition, Primeasia University, Banani, Dhaka, Bangladesh

ABSTRACT

Background: High population density makes Bangladesh more vulnerable to a pandemic situation like COVID-19. It is evident from the scientific literature that proper nutritional practices might be effective in preventing various infections. The objective of this research work was to explore the nutritional as well as lifestyle practices among the urban-rural residents of Jashore district and to assess the association of those practices with their residential settings. **Methods**: It was a cross-sectional study where about 134 respondents (18-50 years) were selected by convenience sampling method from eight rural and seven urban areas of Jashore district in Bangladesh. Association between residence type and various concerned practices have been explored by Pearson chi-square test, binary and multinomial logistic regression analysis. **Results**: It was found from the results of binary and multinomial logistic regression that, the intake of vitamin D rich foods (OR: 3.45; 95% CI: 1.48,8.07), folic acid rich foods (OR:0.20; 95% CI:0.09,0.46), vitamin B12 rich foods (OR:0.11; 95% CI:0.02,0.52), iron rich foods (OR:0.23; 95% CI:0.08,0.66), and melatonin rich foods (OR:0.15; 95% CI:0.05,0.40) were significantly associated (P<.05) with residential area (urban and rural) of the respondents. On the other hand, no association was found (P>.05) between other immune-boosting nutrient-rich foods such as complex carbohydrates, polyunsaturated fatty acid, vitamin A, vitamin E, vitamin C, Pyridoxine, zinc and selenium rich foods and respondents' residential area. Moroever, the association was not observed (P>.05) in case of supplement intake of various immune boosting nutrients and area. Among the lifestyle practices, no significant association was found regarding sleep patterns among the respondents but various daily physical movements (OR: 0.19; 95% CI:0.07,0.48) were found higher among the rural respondents. **Conclusion**: Daily intake of vitamin D rich foods was found higher among the urban respondents but daily intake of folic acid, vitamin B12, iron and melatonin rich foods were found higher among the rural residents. It was also observed that the physical activities were better maintained among the rural respondents than their urban counterparts.

KEYWORDS: nutritional practices, lifestyle practices, urban, rural, Bangladesh.

RECEIVED: 18 February 2024, ACCEPTED: 17 April 2024

TYPE: Original Research

CORRESPONDING AUTHOR: Eyad Ahmed, Institute of Nutrition and Food Science, University of Dhaka, Dhaka-1000, Bangladesh
Email: eyadinfs@gmail.com

Introduction

On January 30, 2020, the World Health Organization (WHO) declared the global occurrence of a medical emergency of worth seeking worldwide significance[1]. Later, in March 2020, the outbreak was proclaimed as a global pandemic[2]. The United States of America, the worst affected country in the world, counted 19,578,217 cases with 339,550 deaths as reported byWHO. Between March 8, 2020, and January 3, 2021, about 516,019 COVID-19 cases were confirmed in Bangladesh, including 7,626 related deaths, according to the Directorate General of Health Services (DGHS) Press Release. The high population density makes Bangladesh more vulnerable to the pandemic situation. As a result, preventing new cases and minimizing death rates is a major challenge for Bangladesh[3]. Infectious rates remain rising among adults ages 31-40 & 21-30, with 27.6% as well as 23.1 percent, accordingly, while the next worst incidence of the disease is 18.5 percent among the population aged 41-50 years of age. However, the infection rate is reported as 13.7 % among the age group of 51-60 years, about 6.4 % among the 61-70 age groups, followed by 5.6 % among the 11-20 age groups. The rate of infection among the 0-10, 71-80 and above 80 age groups is 2.6 %, 2.1%, and 0.7 %, respectively[4]. Robust

immunity is needed for the prevention of various diseases. Adequate nutritional practices are essential for the proper maintenance of strong immunity[5]. Behavior, age, health condition, sexual identity, and medicines also have been found to affect nutritional status[6].

Several studies were found to be conducted regarding nutritional practices[7-10] and lifestyle practices[11-12] in Bangladesh during COVID-19 pandemic. Sunny *et al* (2021) conducted a study among the high school students of Sylhet division; Ritu *et al* (2023) conducted an online based study among the educated young participants regarding their nutritional knowledge, attitude and practices; Jahan *et al* (2023) observed diabetic patients' dietary and physical activity during COVID-19; Ielias *et al* (2023) assessed knowledge and attitude regarding lifestyle and dietary pattern among respondents of 15 to >60 years of age, but practices were not studied; Yeasmin *et al* (2022) observed the lifestyle practices of the population of Rajshahi district but association with residence area was not observed. Among the above-mentioned studies, no study explored the essential nutritional practices among the people of the study area but Zaman *et al* (2024) investigated the hygiene and lifestyle practices of adult respondents of Jashore area[13]. They also determined the dietary diversity of the study participants. Moreover, few other studies were found regarding nutritional and lifestyle practices among different study population during the pandemic situation[14-21], where one study by Gurp *et al* (2022) performed a study on hygiene, nutritional, and health-seeking behavior in rural Bangladesh, where respondents were selected from Jashore area also. However, the current study aimed to investigate the essential nutritional and lifestyle practices among the residents of urban and rural settings of Jashore district during the time period of COVID-19 pandemic in south-western region of Bangladesh.

Methods and Materials

Study design, study area and study period

A cross-sectional study was conducted from 26 November 2020 to 22 January 2021 at the Jashore district in Bangladesh. Jashore is a south-western district of Bangladesh, bordered by India to the west. It is the administrative center of the district and second developed city in Khulna division, with a population of 2,98,000[22]. During the pandemic, strict restrictions had been imposed in several areas of Jashore to break the Covid-19 transmission[23]. Respondents were selected from eight rural (n=65) and seven urban reas (n=69) of Jashore Sadar. The selected rural areas were Ambotlota, Gobila, Shamnagar, Churamonkati, Kashimpur, Bagdanga, Khoyertola, and Ramnagar and the selected urban areas were Palbari, Arabpur, Newmarket, Daratana, Monihar, Dhormatola and Barandipara.

Sampling and sample size

About 134 adult respondents were selected for the current study by convenience sampling technique, where participants were included in the study as per the convenience of the interviewers and the willingness of the respondents. The inclusion criteria for the respondnets in the current study were their age (above 18 years of age), health (free from any major metabolic disease) and mainly their willingness to participate in the study. Due to higher rate of non-responsiveness during pandemic situation, sample size was finally held to be at 134.

Data Collection

A questionnaire was developed and pretested prior to the main study. A pilot study was conducted prior to this main study to validate the feasibility of the questionnaire. The English version of the questionnaire was translated into the local Bengali language for a better understanding of the respondents. Several modifications were undertaken in the questionnaire according to the experiences from the pilot study. The questionnaire was divided into three sections:(1) demographics, (2) essential nutritional, and (3) lifestyle practices. The first section was about the demographic data, including the variables residential area, gender, age, educational level, marital status, occupation. The Essential Nutritional Practices section consists of 24 items and divided into two sections. The respondents were asked regarding their consumption frequency of various nutrient-rich foods and nutrient supplements. The interviewers were properly trained to make sure that the respondents understand the questions very clearly and answered accordingly.

When questioned about any nutrient-rich food, i.e., iron-rich, zinc-rich, the respondents were provided with the names of iron-rich or zinc-rich foods in order to have a proper response from them. The following food names were used as examples to get their answers regarding the intake of a particular nutrient-rich foods: a) *Complex carbohydrate rich foods*: Whole wheat bread, Oats, Pastas, Rice, Brown rice, Barley, Potatoes, Corn, legumes etc.; b) *PUFA rich foods*: Fish (Salmon, Sardine, Hilsha), Oils (Soybean Oil, Safflower Oil, Sunflower Oil, Cottonseed oil), Nuts (Groundnut/Peanut, Almond, Cashew nuts, Walnuts) and Egg yolk; c) *Vitamin A rich foods*: Yellow and green leafy vegetables, Colored fruits, Liver, Kidney, Fish, Egg yolk, Dairy fats etc.; d) *Vitamin E rich foods*: Sunflower, Safflower, Soybean Oil, Peanuts, Tomato, Spinach, Broccoli, Olive, Almonds, Pumpkin, Mango, Avocado, Meat, Eggs, Dairy products etc.; e) *Vitamin C rich foods*: lemon, oranges, pineapple, amloki, guava, tomatoe, lettuce, cabbage, green and yellow vegetables etc.; f) *Vitamin D rich foods*: Animal source foods like Red meat, Liver, Egg yolks, Milk, Yogurt, Fatty fish, Tuna, Salmon, Sardines, Cod liver oil etc.; g) *Vitamin B6 (Pyridoxine) rich foods*: Yeast, Corn, Liver, Kidney, Other meats, Poultry, Tuna, Salmon, Whole Grain Foods etc.; h) *Vitamin B9 (Folic Acid) rich foods*: Fresh green leafy vegetables like spinach, lettuce, Broccoli etc.; i) *Vitamin B12 rich foods*: Lean meat, Fish, Liver, Kidney, Eggs, Milk etc.; j) *Iron rich foods*: Liver, Kidney, Lean meat, Fish, Poultry, Whole grain cereals, Spinach, Broccoli etc.; k) *Zinc rich foods*: Beef, Liver, Oyster, Spices, Wheat Bran, Crab, Lamb, Peanut Butter, Peanuts, Popcorn, Cashew, Oats, Mushroom, Pumpkin Seeds etc.; l) *Selenium rich foods*: Shellfish, Beef, Turkey, Chicken, Whole-wheat bread, Beans, Lentils, Sunflower seeds etc.; m) *Melatonin rich foods*: Eggs, Fish, Nuts, Germinated legumes, Milk, Mushrooms, Cherry etc. The interviewers read aloud the food names to the respondents during their interview. Foods that were not available in the rural are of Jessore were skipped during the interview for convenience. On the other hand, those food names were read aloud to the urban respondents to get their responses regarding the intake of particular nutrient rich foods.

In case of supplement intake, respondents were asked with an adequate explanation of supplements and their usage to extract

proper answers from the respondents. It was required to examine and score respondents' broad knowledge of prospective COVID-19 preventive micronutrients, foods, and supplements. Lifestyle segment measured true participation and adoption of several physical activities. Respondents were selected from both rural and urban areas. Participants from various villages of the Jashore district were categorized into 'rural', and those from various urban towns and cities were grouped into 'urban'.

Data Analysis

Different software was used for data management and analysis like Microsoft (MS) Excel and IBM SPSS version 25.0. Pearson chi-square test, binary and multinomial logistic regression analysis were used to assess the association between the categorical variables in the current study. However, mean, standard deviation, frequency, percent were also obtained.

Results and Discussion

Respondents' sociodemographic characteristics by their residential area is depicted in Table 1 below. About 51.5% were residents of urban and 48.5% were residents of rural areas. It was found that about 66.2% of the rural respondents were male, and 33.8% of the respondents were female. About 62.3% of the urban respondents were female, and 37.7% of the respondents were male. About 73.9% of urban residents were married, and 32.3% rural resident was unmarried. About 30.8% (20) of rural participants completed HSC, and 50.7% (35) of urban participants completed a Bachelor or higher level of degree. About 32.3% (21) of the rural participants were students, and 31.9% (22) of urban respondents were housewife. Gender, educational status and occupation of the respondents were found to be significantly differ ($p<.05$) between urban and rural area.

Table 1. Percent distribution of the respondents by socio-demographic characteristics and residential area (n=134)

Variables	Total N (%)	Urban N (%)	Rural N (%)	Chi-square	*P-value
Total respondent	134 (100)	69 (51.5)	65 (48.5)		
Gender					
Male	69 (51.49)	26 (37.7)	43 (66.2)	10.86	.001
Female	65 (48.51)	43 (62.3)	22 (33.8)		
Age					
≤30	72 (53.73)	35 (50.8)	37 (56.9)	0.83	.66
31-40	29 (21.64)	17 (24.6)	12 (18.5)		
≥41	33 (24.63)	17 (24.6)	16 (24.6)		
Education					
JSC and below	31 (23.13)	7 (10.2)	24 (36.8)	22.24	.000
SSC	21 (15.67)	11 (15.9)	10 (15.4)		
HSC	36 (26.87)	16 (23.2)	20 (30.8)		
Bachelor and above	46 (34.33)	35 (50.7)	11 (17.0)		
Marital status					
Married	95 (70.90)	51 (73.9)	44 (67.7)	0.63	.452
Unmarried	39 (29.10)	18 (26.1)	21 (32.3)		
Occupation					
Service	25 (18.66)	19 (27.5)	6 (9.2)	15.33	.004
Business	17 (12.69)	6 (8.7)	11 (16.9)		
Housewife	38 (28.36)	22 (31.9)	16 (24.6)		
Student	41 (30.60)	20 (29.0)	21 (32.3)		
Others	13 (9.70)	2 (2.9)	11 (17.0)		

*p-value was obtained from Chi-square test

Nutritional Practices

In Table 2, it can be seen that about 66 urban repondents and 63 rural respondents had taken complex carbohydrate-rich foods every day. Moreover, about 65 urban respondents and 61 rural respondents had eaten Polyunsaturated Fatty Acids (PUFA) rich foods every day. However, about 1.4% of urban and 3.1% of rural residents never took PUFA-rich food during the previous week of the study.

Table 2. Intake of complex carbohydrate and PUFA-rich foods (last seven-day frequency) by their residential area

Macronutrients	Area		Total N (%)	*P-value
	Urban N (%)	Rural N (%)		
Complex carbohydrate-rich foods				0.175
≤ 6 days	3 (4.3)	2 (3.1)	5 (3.7)	
Every day (7 days)	66 (95.7)	63 (96.9)	129 (96.3)	
PUFA-rich foods				0.254

≤ 6 days	4 (5.7)	4 (6.2)	8 (6.0)
Every day (7 days)	65 (94.2)	61 (93.8)	126 (94.0)

*p-value was obtained from Chi-square test

Table 3 depicts that about 47 urban respondents and 34 rural respondents had taken Vitamin A-rich foods every day; about 91.3% of urban and about 83.1% of rural residents had consumed Vitamin E rich foods every day. The percentage of urban residents who consumed Vitamin C, Vitamin D, Vitamin B6, Vitamin B9, and Vitamin B12 on a daily basis in the previous week was about 26.1%, 15.9%, 23.2%, 73.9%, and 94.2%, respectively. On the other hand, the percentages of rural residents who consumed foods containing Vitamin C, Vitamin D, Vitamin B6, Vitamin B9, and Vitamin B12 were 20%, 38.5%, 29.2%, 35.4%, and 72.3%, respectively. About 78.3% of urban and 32.3% of rural residents consumed iron-rich every day. About three-fourths of the urban residents (78.3%) had consumed iron-rich food every day. On the other hand, about 49 urban and 41 rural respondents had consumed zinc-rich foods, and 37 urban and 30 rural respondents had eaten selenium-rich foods for less than or equal to 3 days per week. About 85.5% of urban and about 49.2% of rural residents had taken melatonin-rich foods every day.

Table 3. Intake of vitamin and mineral rich foods (seven-day food frequency) by residential area of the respondents

Food consumption	**Area**		**Total N (%)**	***P-value**
	Urban N (%)	**Rural N (%)**		
Vitamin A-rich foods				
≤3 days	12 (17.4)	19 (29.2)	31(23.1)	0.152
4 to 6 days	10 (14.5)	12 (18.5)	22(16.4)	
Every day (7 days)	47 (68.1)	34 (52.3)	81(60.4)	
Vitamin E-rich foods				
≤ 3 days	4 (5.8)	8 (12.3)	12(9.0)	0.820
4 to 6 days	2 (2.9)	3 (4.6)	5(3.7)	
Every day (7 days)	63 (91.3)	54 (83.1)	117(87.3)	
Vitamin C-rich foods				
≤3 days	39 (56.5)	38 (58.4)	77(57.5)	0.109
4 to 6 days	12 (17.4)	14 (21.5)	26(19.4)	
Every day (7 days)	18 (26.1)	13 (20)	31(23.1)	
Vitamin D-rich foods				
≤3 days	44 (63.8)	29 (44.7)	73(54.5)	0.003
4 to 6 days	14 (20.3)	11 (16.8)	25(18.7)	
Every day (7 days)	11 (15.9)	25 (38.5)	36(26.9)	
Vitamin B6-rich foods				
≤3 days	31 (44.9)	33 (50.8)	64(47.8)	0.194
4 to 6 days	22 (31.9)	13 (20.0)	35(26.1)	
Every day (7 days)	16 (23.2)	19 (29.2)	35(26.1)	
Vitamin B9-rich foods				
≤3 days	12 (17.4)	27 (41.5)	39(29.1)	0.001
4 to 6 days	6 (8.7)	15 (23.1)	21(15.7)	
Every day (7 days)	51 (73.9)	23 (35.4)	74(55.2)	
Vitamin B12-rich foods				
≤3 days	2 (2.9)	5 (7.7)	7(5.2)	0.021
4 to 6 days	2 (2.9)	13 (20.0)	15(11.2)	
Every day (7 days)	65 (94.2)	47 (72.3)	112(83.6)	
Iron-rich foods				
≤3 days	8 (11.5)	32 (49.3)	40(29.9)	0.001
4 to 6 days	7 (10.1)	12 (18.4)	19(14.2)	
Every day (7 days)	54 (78.4)	21 (32.3)	75(56.0)	
Zinc-rich foods				
≤3 days	49 (71.0)	41 (63.1)	90(67.2)	0.289
4 to 6 days	12 (17.4)	14 (21.5)	26(19.4)	
Every day (7 days)	8 (11.6)	10 (15.4)	18(13.4)	
Selenium-rich foods				
≤3 days	37 (53.6)	30 (46.1)	67(50.0)	0.457
4 to 6 days	8 (11.6)	14 (21.5)	22(16.4)	
Every day (7 days)	24 (34.8)	21 (32.3)	45(33.6)	

Melatonin-rich foods				
≤3 days	6 (8.7)	22 (33.8)	28(20.9)	0.001
4 to 6 days	4 (5.8)	11 (16.9)	15(11.2)	
Every day (7 days)	59 (85.5)	32 (49.2)	91(67.9)	

*p-value was obtained from Chi-square test

Table 4 describes that only about 1.5% of the rural respondents took Vitamin-A supplements, and no urban residents took them as supplements. Mostly, about 98.6% of rural respondents took zinc supplements, and 1.4% of urban respondents took zinc supplements. About 11.6% of urban respondents and about 4.6% of rural respondents took vitamin-C supplements. No rural residents had consumed vitamin-E supplements, and Melatonin supplements were taken by only about 1.4% of urban residents. On the contrary, no rural resident had taken melatonin supplements

Table 4. Dietary supplement intake by the residential area of the respondents

Supplements	**Area**		**Total N (%)**	***P-value**
	Urban N (%)	**Rural N (%)**		
Vitamin A				
Yes	0 (0.0)	1 (1.5)	1(0.7)	0.301
No	69 (100)	64 (98.5)	133(99.3)	
B-Vitamins				
Yes	4 (5.8)	1 (1.5)	5(3.7)	0.194
No	65 (94.2)	64 (98.5)	129(96.3)	
Vitamin C				
Yes	8 (11.6)	3 (4.6)	11(8.2)	0.141
No	61 (88.4)	62 (95.4)	123(91.8)	
Vitamin D				
Yes	2 (2.9)	3 (4.7)	5(3.7)	0.588
No	67 (97.1)	62 (95.3)	129(96.3)	
Multivitamins				
Yes	0 (0.0)	1 (1.5)	1(0.7)	0.301
No	69 (100)	64 (98.5)	133(99.3)	
Vitamin E				
Yes	1 (1.4)	0 (0.0)	1(0.7)	0.330
No	68 (98.6)	65 (100)	133(99.3)	
Iron				
Yes	2 (2.9)	0 (0.0)	2(1.5)	0.167
No	67 (97.1)	65 (100)	132(98.5)	
Zinc				
Yes	1 (1.4)	2 (3.1)	3(2.2)	0.524
No	68 (98.6)	63 (96.9)	131(97.8)	
Melatonin				
Yes	1 (1.4)	0 (0.0)	1(0.7)	0.330
No	68 (98.6)	65 (100)	133(99.3)	

*p-value was obtained from Chi-square test

Lifestyle Practices

Table 5 shows the Association between lifestyle practices of the respondents and residential area. It can be observed that bed time and water intake was not significantly differenet between the respondents of urabn and rural settings (P>.05). different kinds of physical activities were found to different among the respondents of these two settings such as jogging/swimming/walking was more common among the rural respondents (78.5%) than their urban counterparts (49.3%). Free hand exercise was also found higher among the rural ones.

Table 5. Association between lifestyle practices of the respondents and residential area

Lifestyle practices	**Area**		**Total N (%)**	***P-value**
	Urban N (%)	**Rural N (%)**		
Sleep before 11 pm or 12 am				
Yes	41 (59.4)	43 (66.2)	84(62.7)	0.266

No	28 (40.6)	22 (33.8)	50(37.3)	
Water intake per day (2.5-3.5 litre)				
Yes	49 (71.0)	48 (73.8)	97(72.4)	0.432
No	20 (29.0)	17 (26.2)	37(27.6)	
Physical activities everyday				
Jogging/ swimming/ walking for 15-30 minutes	34 (49.3)	51 (78.5)	85(63.4)	.001
Free hand exercise/ yoga	4 (5.8)	7 (10.8)	11(8.2)	
Prayers related movement/ meditation	25 (36.2)	7 (10.8)	32(23.9)	
None	6 (8.7)	0 (0.0)	6(4.5)	

*p-value was obtained from the chi-square test

Association between the nutritional and lifestyle practices and respondents' residential area

Table 6 illustrates the association between the nutritional and lifestyle practices and respondents' residential area. It was observed the results of binary and multinomial logistic regression analysis that among the nutritional practices, intake of vitamin D, folic acid, cyanocobalamin, iron and melatonin rich foods were found to be significantly associated with the respondents' residential area. No association was found between supplement intake and area. However, among the lifestyle practices, sleep and water intake were not significantly associated but various physical activities were found to be associated. Jogging/walking/swimming was found higher among the rural respondents, free hand exercise/yoga was also found higher among the urban respondents. Prayer related movement/meditation was held as reference category in this regard for multinomial logistic regression and rural category was held as reference in all analysis.

Table 6. Association between the nutritional and lifestyle practices and respondents' residential area (binary and multiple logistic regression analysis)

Dependent Variables	Residence (RC: Rural) OR (95% CI)	Dependent Variables	Residence (RC: Rural) OR (95% CI)
Nutritional Practices		**Nutritional Practices**	
Complex CHO RF		**Se RF**	
≤6 days	1.43(0.23,8.86)	≤3 days	1.08(0.51,2.30)
7 days	Reference	4 to 6 days	0.50(0.18,1.43)
PUFA RF		7 days	Reference
≤6 days	0.94(0.23,3.92)	**Melatonin RF**	
7 days	Reference	≤3 days	0.15(0.05,0.40)*
Vitamin A RF		4 to 6 days	0.20(0.06,0.68)*
≤3 days	0.46(0.19,1.07)	7 days	Reference
4 to 6 days	0.60(0.23,1.56)	**Supplements**	
7 days	Reference	**B vitamins**	
Vitamin E RF		Yes	3.94(0.43,36.20)
≤3 days	0.43(0.12,1.50)	No	Reference
4 to 6 days	0.57(0.09,3.55)	**Vitamin C**	
7 days	Reference	Yes	2.71(0.68,10.70)
Vitamin C RF		No	Reference
≤3 days	0.75(0.32,1.72)	**Vitamin D**	
4 to 6 days	0.62(0.22,1.78)	Yes	0.61(0.10,3.76)
7 days	Reference	No	Reference
Vitamin D RF		**Zn**	
≤3 days	3.45(1.48,8.07)*	Yes	0.46(0.04,5.24)
4 to 6 days	2.89(1.01,8.36)	No	Reference
7 days	Reference	**Lifestyle Practices**	
Vitamin B6 RF		**Sleep before 11 pm or 12 am**	
≤3 days	1.12(0.49,2.55)		
4 to 6 days	2.01(0.77,5.22)	Yes	0.75(0.37,1.51)
7 days	Reference		
Vitamin B9 RF		No	Reference
≤3 days	0.20(0.09,0.46)*		
4 to 6 days	0.18(0.06,0.52)*	**Drink 2.5-3.5 litter water**	
7 days	Reference		

Vitamin B12 RF		Yes	0.87(0.41,1.85)
≤3 days	0.28(0.05,1.56)		
4 to 6 days	0.11(0.02,0.52)*	No	Reference
7 days	Reference		
Fe RF		**Physical activity**	
≤3 days	0.09(0.04,0.25)*		
4 to 6 days	0.23(0.08,0.66)*	Jogging/walking/swimming	0.19(0.07,0.48)*
7 days	Reference		
Zn RF		Free hand exercise/yoga	0.16(0.04,0.71)*
≤3 days	1.49(0.54,4.13)		
4 to 6 days	1.07(0.32,3.59)	Prayer related movement/meditation	Reference
7 days	Reference		

It has been found in the current study that vitamin D, folic acid, vitamin B12, iron, and melatonin-rich food intake was higher among the urban respondents than those of rural. On the other hand, the scenario of complex carbohydrates and PUFA-rich foods, other supplement intake did not significantly differ between urban and rural respondents. Sunny *et al* (2021) and Ritu *et al* (2023) also did not find differences in various nutritional practices by area of residence area[9-10]. The intake of vitamin D rich foods (OR: 3.45; 95% CI: 1.48,8.07), folic acid rich foods (OR:0.20; 95% CI:0.09,0.46), vitamin B12 rich foods (OR:0.11; 95% CI:0.02,0.52), iron rich foods (OR:0.23; 95% CI:0.08,0.66), and melatonin rich foods (OR:0.15; 95% CI:0.05,0.40) were significantly associated (P<.05) with residential area (urban and rural) of the respondents. On the other hand, no association was found (P>.05) between other immune-boosting nutrient-rich foods such as complex carbohydrate, polyunsaturated fatty acid, vitamin A, vitamin E, vitamin C, Pyridoxine, zinc and selenium rich foods and respondents' residential area. Moroever, association was not observed (P>.05) in case of supplement intake of various immune boosting nutrients and area. Among the lifestyle practices, no significant association was found regarding sleep pattern among the respondents but various daily physical movements (OR: 0.19; 95% CI:0.07,0.48) were found higher among the rural respondents. Similar findings were observed in another study by Zaman et al (2024)[13]. They also showed that rural lifestyle practices were better maintained in comparison to urban lifestyle. Islam *et al* (2021) found that residential area was one of the associated factors of adverse lifestyle during COVID-19[24]. Study by Mohsin *et al* (2021) observed association between COVID-19 severity and sleep disturbance along with smoking habit[25].

Strengths and limitation

Due to the coronavirus pandemic situation, many respondents were reluctant to give information about some questions to ensure safety. A representative sample of the population could not be ensured due to the situation. The food consumption data was collected by only one recall of seven-day food frequency, which could have been improved if multiple recalls were executed in consecutive weeks.

Conclusion

It is evident from the literature that essential nutritional and lifestyle practices can be effective in preventing COVID-19. Moreover, good nutritional practice is important in providing immunity against Covid-19. Since the purpose of the current study was to explore these practices in the residential area of Jashore in Bangladesh, it can be concluded that the daily intake of vitamin D rich foods was found higher among the urban respondents but daily intake of folic acid, vitamin B12, iron and melatonin rich foods were found higher among the rural residents. It was also observed that the physical activities were better maintained to some extent in rural areas in comparison with respondents of urban areas. Proper education and awareness about good nutritional and lifestyle practices among the people of the studied area might be disseminated to further enhance these practices for better immunity.

Conflict of Interest

Authors declare no conflict of interest.

Acknowledgment

We thank and acknowledge all of the respondents and field-workers of the current study.

Funding

No funding was available for the current study.

References

1. W. Luo, Z. Xiong, H. Tang, and H. Zhou, "A family outbreak of coronavirus disease 2019," *J. Cent. South Univ. (Medical Sci.*, vol. 45, no. 3, pp. 275–279, 2020. DOI: 10.11817/j.issn.1672-7347.2020.200099
2. J. Yu, P. Chai, S. Ge, and X. Fan, "Recent Understandings Toward Coronavirus Disease 2019 (COVID-19): From Bench to Bedside," *Front. Cell Dev. Biol.*, vol. 8, no. June, 2020. DOI: 10.3389/fcell.2020.00476
3. S. Islam, R. Islam, F. Mannan, S. Rahman, and T. Islam, "COVID-19 pandemic: An analysis of the healthcare, social and economic challenges in Bangladesh," *Prog. Disaster Sci.*, vol. 8, 2020. DOI: 10.1016/j.pdisas.2020.100135
4. Mina FB, Billah M, Rahman MS, Das S, Karmakar S, Faruk M, Hasan UK. COVID-19: transmission, diagnosis, policy intervention, and potential broader perspective on the rapidly evolving situation in Bangladesh. J Adv Biotechnol Exp Ther. 2020;3(4):18-29. DOI: 10.5455/jabet.2020.d152
5. EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies), 2016. Guidance on the scientific requirements for health claims related to the immune system, the gastrointestinal tract and defence against

pathogenic microorganisms. EFSA Journal 2016;14(1):4369, 23 pp. DOI:10.2903/j.efsa.2016.4369
6. M. Farhan Aslam, S. Majeed, S. Aslam, and J. A. Irfan, "Vitamins: Key Role Players in Boosting Up Immune Response-A Mini Review," *Vitam. Miner.*, vol. 06, no. 01, 2017, doi: 10.4172/2376-1318.1000153.
7. Sunny AH, Chowdhury MS, Ullah MO. Lifestyle and dietary habits of high school going students in north-eastern part of Bangladesh during COVID-19 Pandemic. Asian Journal of Medical and Biological Research. 2021 Dec 30;7(4):359-66. DOI: 10.3329/ajmbr.v7i4.57616
8. Ritu RB, Mondal R. Nutritional knowledge attitudes and practices towards the prevention and control of COVID-19 among educated young adults in Bangladesh. J Xiangya Med 2023. DOI: 10.21037/jxy-22-50
9. Jahan I, Hasan AN, Sharif AB, Akter S. Changes in dietary habit and physical activity among the diabetic patients of Bangladesh during COVID-19: A cross-sectional study. PLOS Global Public Health. 2023 Jun 29;3(6):e0002096. DOI: 10.1371/journal.pgph.0002096
10. Huq AO, Uddin I, Islam MT, Ahmed E, Siddique MA, Rahim AB, Talukder MU, Nigar S, Abedin N, Arjoo M. COVID-19 Pandemic and Immune Boost up: The Synergistic Role of Nutrients. Current Research in Nutrition & Food Science. 2021 Dec 1;9(3).
11. Khan I, Setu SS, Rahman M, Hasan MS, Yeasmin E, Rini AH. Knowledge and attitudes towards dietary patterns and lifestyle during COVID-19 pandemic in Bangladesh: an online based cross-sectional study. International Journal of Community Medicine and Public Health. 2023 Mar;10(3):974. DOI: 10.18203/2394-6040.ijcmph20230609
12. Yeasmin K, Samaun MA, Jahan H, Yesmin T. Lifestyle and Immunity Boosting Practices During COVID-19 Pandemic Among the Population of Rajshahi District, Bangladesh. Journal of Bio-Science. 2022;30(1):33-48. DOI: 10.3329/jbs.v30i1.63099.
13. Zaman S, Ahammed T. Dietary diversity, hygiene, and lifestyle practices among adult residents during COVID-19 pandemic: A cross-sectional study from Bangladesh. Food and Humanity. 2024 May 1;2:100207.
14. Zuthi MF, Hossen MA, Pal SK, Mazumder MH, Hasan SF, Hoque MM. Evaluating knowledge, awareness and associated water usage towards hand hygiene practices influenced by the current COVID-19 pandemic in Bangladesh. Groundwater for Sustainable Development. 2022 Nov 1;19:100848. DOI: 10.1016/j.gsd.2022.100848
15. Islam SD, Mondal PK, Ojong N, Bodrud-Doza M, Siddique MA, Hossain M, Mamun MA. Water, sanitation, hygiene and waste disposal practices as COVID-19 response strategy: insights from Bangladesh. Environment, development and sustainability. 2021 Aug;23:11953-74. DOI: 10.1007/s10668-020-01151-9
16. Alam MU, Sharior F, Shoaib DM, Hasan M, Tabassum KF, Ferdous S, Hasan M, Rahman M, Tidwell JB, Zaqout M, Farah M. Hygiene knowledge and practices and determinants of occupational safety among waste and sanitation workers in Bangladesh during the COVID-19 pandemic. Hygiene and Environmental Health Advances. 2022 Dec 1;4:100022. DOI: 10.1016/j.heha.2022.100022
17. Van Gurp M, Riad IM, Islam KA, Islam MS, Geervliet RM, Bakker MI. WASH, nutrition and health-seeking behavior during COVID-19 lockdowns: Evidence from rural Bangladesh. Plos one. 2022 Dec 7;17(12):e0278525. DOI: 10.1371/journal.pone.0278525
18. Islam MS, Ullah MA, Islam US, Hossain S, Araf Y, Das A, Khan AN, Islam NN, Sarkar B, Shohael AM. Influence on attitudes and lifestyle due to lockdown amidst COVID-19 pandemic: a perception-based analysis among Bangladeshi residents. BMC Public Health. 2021 Dec;21:1-3. DOI: 10.1186/s12889-021-12012-z
19. Mohsin FM, Nahrin R, Tonmon TT, Nesa M, Tithy SA, Saha S, Mannan M, Shahjalal M, Faruque MO, Hawlader MD. Lifestyle and Comorbidity-Related Risk Factors of Severe and Critical COVID-19 Infection: A Comparative Study Among Survived COVID-19 Patients in Bangladesh. Infection and Drug Resistance. 2021 Sep 30:4057-66. DOI: 10.2147/IDR.S331470
20. Hossain ME, Islam MS, Rana MJ, Amin MR, Rokonuzzaman M, Chakrobortty S, Saha SM. Scaling the changes in lifestyle, attitude, and behavioral patterns among COVID-19 vaccinated people: insights from Bangladesh. Human Vaccines & Immunotherapeutics. 2022 Jan 31;18(1):2022920. DOI: 10.1080/21645515.2021.2022920
21. Johora F, Abbasy AA, Jeenia FT, Bhowmik MC, Aktar M, Choudhury NA, Moitra P, Ferdoush J. COVID-19 Pandemic and Prevalence of Self-Care Practices among the Future Physicians: A Bangladesh Study. Chatt Maa Shi Hosp Med Coll J [Internet]. 2021 Nov. 11;20(2):22-7. DOI: 10.3329/cmoshmcj.v20i2.56468
22. Jessore. Wikipedia. Accessed on September 28, 2023. Available at: https://en.wikipedia.org/wiki/Jessore
23. Strict restrictions in 2 Jessore areas to contain Covid spread. June 10, 2021, Dhaka Tribune. Accessed on: September 28, 2023, Available at: https://www.dhakatribune.com/bangladesh/health/249189/strict-restrictions-in-2-jessore-areas-to-contain.