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A study on dietary intake among school-going adolescent girls of Udaipur, Rajasthan during COVID-19

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ABSTRACT: Adolescent girls deal with several major nutritional issues that impair their growth and development and their ability to support themselves as adults. The COVID-19 pandemic may have brought out changes in the lifestyle behaviour of adolescent girls, such as their food habits. Given this effect, a cross-sectional study was carried out to assess the dietary intake of adolescent girls aged 13 to 18 years in Udaipur, Rajasthan. Percent adequacy of dietary intake was assessed using the 24-hour dietary recall method and the average daily dietary intake was compared to the RDA (2020) and RDI (2010). The results of the study found that almost all the girls consumed very less amount of milk and its products, pulses, and GLV's along with cereals. However, there was adequate consumption of fruits, other vegetables, sugar, fats, and oils among both age groups. Intake of roots and tubers was adequate for girls aged 13 to 18 years but not for 16 to 18 aged girls. The average per adequacy nutrient intake of age group 13-15 and 16-18 years for energy, iron, calcium, vitamin B_1, B_2, B_3, and zinc was lower compared to RDA. Intake of CHO was found to be higher, whereas the intake of vitamin C, protein, fat, and folate was found to be adequate in the diet of both age groups. The findings of the study revealed that there was inadequate dietary intake among adolescent girls during the COVID-19 period, therefore it is important to promote the proper type of nutrition, and health education to avoid the development of unhealthy eating habits and thereby prevent the subsequent risk of degenerative diseases such as obesity, diabetes, cardiovascular pathologies, etc.

Key words: Adolescent girls, COVID-19, dietary intake, nutrition

In recent years, the coronavirus (COVID-19) outbreak has been regarded as the greatest threat to global health. This situation triggered a public health emergency of international significance, prompting the World Health Organization (WHO) to designate COVID-19 a pandemic, on March 11, 2020 (WHO, 2020). Many countries, including India, had to issue stay-at-home advisories and implement lockdown restrictions and social distancing procedures because of the global COVID-19 pandemic and the necessity to control the spread and transmission of the coronavirus (Ghosh *et al.*, 2020 and Patel *et al.*, 2021).

There have been numerous instances in the past where the public was subjected to restrictions as a result of natural catastrophes (such as tornadoes, hurricanes, and earthquakes) or man-made calamities (such as war and similar circumstances) have had serious implications, such as lack of resources and lifestyle changes, which has resulted in disturbances in overall health of the population (Giorgadze *et al.*, 2011, Trevisan *et al.*, 1986, Ghosal *et al.*, 2020).

Adolescence is an important life stage that occurs between childhood and adulthood and is defined by significant physical, mental, and social changes (Patton *et al.*, 2016). Adolescent lifestyle activities, such as food consumption and physical exercise, create patterns that impact behaviour throughout adulthood and can have long-term health consequences (Blakemore and Mill, 2014 and Mokdad, 2016). In the early phases of infancy and adolescence, adequate nutrition is considered a possible factor for health (Glabska *et al.*, 2020). It is critical to develop appropriate eating habits throughout this stage, i.e., the transition from childhood to maturity, to affect present health state and propensity to diseases in adulthood, such as obesity, diabetes, cardiovascular pathologies, and so on. Adolescent girls constitute an important segment

of the population. Their health status influences their reproductive functioning, pregnancy outcomes, birth weight, pregnancy wastage etc (Baliga *et al.*, 2014). The epidemic's isolation affects diet, especially among teenagers, who are more prone to developing bad eating habits (Singh and Wadhawan *et al.*, 2021). Nutritional intervention in combination with medical therapy, is a powerful tool to prevent and treat disease and disease-related symptoms. Emerging data from studies on COVID-19 and PASC, as well as studies on related respiratory viral infections and post-infection symptoms, indicates possible roles for nutrition in managing symptoms and improving clinical outcomes. By influencing both innate and adaptive immunity, nutrition may have an indirect impact on the risk of contracting COVID-19 (Kompaniyets *et al.*, 2021). Several globally recognized organisations have released dietary recommendations related to the SARS-CoV-2 pandemic (Rust and Ekmekcioglu, 2023). Various health organizations such as the WHO or UNICEF, as well as national organizations recommend the consumption of vegetables, fruits and whole grains, as the main components of a healthy diet (Montenegro-Landivar *et al.*, 2021). The Indian AYUSH ministry also made recommendations for food and nutrition during the confinement periods, as there is a strong link between the quality of a population's food and its health (Muscogiuri *et al.*, 2020).

A study conducted by Roso *et al.*, (2020) among adolescents of five different countries, including Spain, Italy, Brazil, Colombia, and Chile, to assess dietary trends and results of the study concluded that COVID-19 confinement had an impact on their eating habits where consumption of legumes, vegetables, and fruit intakes was significantly increased and fast-food intake was dramatically reduced. In another study by Pietrobelli *et al.* (2020), the results of the study discovered a rise in fruit consumption among children and adolescents in Italy.

It is necessary to evaluate the intake of food during COVID-19 among adolescent girls. Therefore, the study was designed to study the pattern of consuming different food groups among adolescent girls residing in Udaipur, Rajasthan, India. This could help public health officials shape their suggestions for future measures in terms of nutrition policies for teenagers.

MATERIALS AND METHODS

The study was undertaken in March 2021. The target population was one hundred and twenty urban adolescent girls aged 13 to 18 years. The subjects were taken from two schools in Udaipur district, Rajasthan, and were selected by purposive random sampling method. The data were collected from respondents through a personal interview while keeping in mind the COVID-19 guidelines. A well-structured interview schedule was prepared and pretested to collect data on the dietary intake of all subjects. The dietary intake of adolescent girls was analyzed with the help of the 24-hour dietary recall method. Each participant was asked about the type and quantity of food consumed by them on the previous day. The type and quantity of food items consumed were assessed six times a day, including early morning, breakfast, mid-morning, lunch, evening snacks, and dinner. To maximize the accuracy of the study, standardized cup sets were used while interviewing them for their dietary intake throughout the whole day. Further converted in terms of raw ingredients and quantified raw food was reported in grams.

The mean dietary intake of different foods consumed was then calculated and compared with recommended dietary intake (NIN, ICMR, 2010) and recommended dietary allowances (NIN, ICMR, RDA, 2020) & for adolescent girls aged 13-15 and 16-18 years.

The data collected were tabulated and analysed using Diet Cal. Software. A z-test was used to compare nutrient and food intake with standard values.

RESULTS AND DISCUSSION

Food intake of adolescent girls: Intake of root & tubers (95.94 %), fruits (97.5%), sugar & jaggery

(92.6%), fats & oils (96.97 %), other vegetables (53.24%) among adolescent girls aged 13 to 15 years were found to be adequate as depicted in Table 1. In contrast, the consumption of food groups such as cereals (72.84%) was found to be lower than RDI and intake of pulses (41.35%), milk & milk products (44.05%), GLVs (46%), was found to be low than recommended dietary intake during COVID-19 period.

For girls aged 16 to 18 years, intake of fruits (91.42%), sugar & jaggery (91.12%), and fats & oils (99.03 %), and other vegetables (53.79 %), were near to the recommended values. In contrast, the consumption of cereals (81.48 %) was lower than RDI whereas intake of pulses (42.13%), milk & milk products (40.20%), GLVs (47.5%), roots & tubers (41.70 %) was not adequate as recommended by ICMR, NIN (2010) as presented in figure 2.

Nutrient Intake of adolescent girls: The results of the study found that the average per cent adequacy nutrient intake of age group 13-15 and 16-18 years for energy (65.86%, 64.43%), iron (40.44%,41.77 %), calcium (43.79%,36.96%), vitamin B_1(71.00%, 73.76%), B_2(30.80%, 29.78%), B_3 (46.79%, 47.06%), and zinc (62.79%, 63.39%) was low when compared to RDA. Intake of CHO (177.58 %, 185.16 %) was found to be higher, whereas the intake of vitamin C (86.25%, 80.25%), protein (98.98%,98.98%), fat (80.54%, 77.52%), and folate (85.40%, 81.51%) was found to be adequate in the diet of both age groups as shown in figure 3 and 4. The relationship between nutrition and the immune system is well known, so much attention is being paid to its role in COVID-19 (Butler *et al.*, 2021). Consuming a good quality diet is essential for a healthy immune system, and deficits in a variety of nutrients raise a person's risk of developing serious clinical symptoms as well as their vulnerability to viral infection. The purpose of this study was to analyse the dietary patterns of adolescent girls during the pandemic. The results of the present study reported that the daily nutrient intake of girls aged 13 to 18 years was not up to the mark as per recommendations. Intake of food groups such as root and tubers, fruits, vegetables, sugar and jaggery fats and oils was adequate whereas cereals, pulses, milk, and milk products was lower than RDI. Previous studies reported lower consumption of fruits and vegetables as per the recommendations among adolescents (Salwa *et al.*, 2021). The primary food groups in the diets of the selected teenagers were roots and tubers, followed by pulses, cereal and

Table 1: Daily mean food intake and per adequacy of food intake of adolescent girls **(n=120)**

Food groups	Age groups(years)	RDI Value	Actual intake Mean ± SD	Z value	% Intake
Cereals & millets	13-15 years	330	240.38±37.82	2.36*	72.84
	16-18 years	330	268.89±29.90	2.04*	81.48
Pulses	13-15 years	60	24.81±12.5	2.81**	41.35
	16-18 years	75	31.6±10.56	4.10**	42.13
Milk & milk products	13-15 years	500 ml	220.26±113.77	2.45*	44.05
	16-18 years	500 ml	201±90.98	3.28**	c
Roots & tubers	13-15 years	100	95.94±48.69	0.08NS	95.94
	16-18 years	200	83.41±33.13	3.51**	41.70
Green leafy vegetables	13-15 years	100	46±20.28	2.66**	46
	16-18 years	100	47.5±9.57	5.48**	47.5
Other vegetables	13-15 years	200	106.49±65.28	1.43NS	53.24
	16-18 years	200	107.56±47.51	1.94NS	53.79
Fruits	13-15 years	100	97.5±24.92	0.10NS	97.5
	16-18 years	100	91.42±22.67	0.37NS	91.42
Sugar and jaggery	13-15 years	25	23.15±1.23	1.50NS	92.6
	16-18 years	25	22.78±1.09	1.24NS	91.12
Fat/oil (visible)	13-15 years	40	38.79±2.78	0.43NS	96.97
	16-18 years	35	34.66±5.32	0.003NS	99.031

*Significant at ($p<0.05$), **Significant at ($p<0.01$), NS= non-significant, # Source: RDI- Recommended dietary intake, NIN, ICMR (2010)

Table 2: Mean nutrient intake and per adequacy of nutrient intake of the subjects (n=120)

Nutrients	Age groups	Reference Value #	Actual Intake Mean SD	Z value	% Intake
Energy(Kcal/d)	13-15 years	2400	1580.80±237.46	3.4**	65.86
	16-18 years	2500	1610.79±230.07	3.86**	64.43
Protein(g/d)	13-15 years	43.2	42.76±7.22	0.06NS	98.98
	16-18 years	46.2	45.75±7.70	0.05NS	99.03
Total fat(g/d)	13-15 years	66.66	53.69±7.99	1.62NS	80.54
	16-18 years	66.66	51.68±8.77	1.70NS	77.52
CHO(g/d)	13-15 years	130	230.86±25.70	-3.92**	177.58
	16-18 years	130	240.72±28.56	-3.87**	185.16
Ca(mg/d)	13-15 years	1000	437.96±176.94	3.17**	43.79
	16-18 years	1050	388.13±181.51	3.64**	36.96
Fe(mg/d)	13-15 years	30	12.13±2.06	8.67**	40.44
	16-18 years	32	13.26±1.75	10.65**	41.77
Vit C(mg/d)	13-15 years	66	56.92±26.03	0.34NS	86.25
	16-18 years	68	54.57±24.97	0.53NS	80.25
B1(mg/d)	13-15 years	1.6	1.13±0.16	2.93**	71.00
	16-18 years	1.7	1.25±0.14	3.21**	73.76
B2(mg/d)	13-15 years	2.2	0.67±0.18	8.5**	30.80
	16-18 years	2.3	0.68±0.15	10.51**	29.78
B3(mg/d)	13-15 years	16	7. 48±1.2	7.1**	46.79
	16-18 years	17	8±1.12	8.03**	47.06
Folate(µg/d)	13-15 years	245	209.25±54.72	0.65NS	85.40
	16-18 years	270	220.09±57.54	0.86NS	81.51
Zn(mg/d)	13-15 years	12.8	8.03 ±1.17	4.07**	62.79
	16-18 years	14.2	9±1.25	4.13**	63.39

*Significant at ($p<0.05$), **Significant at ($p<0.01$), NS=non-significant, # Source: RDA- Recommended dietary Allowance, NIN, ICMR (2020)

millet, and sugar; there was a modest amount of fats and oils and vegetables, but a dearth of green leafy vegetables, milk and milk products, fruits, meat, and poultry when compared to the recommended dietary allowances (Seth, 2021). Bharathi, 2021 concluded that rural women of all ages did not consume at least a third of the RDI for pulses. Compared to rural women, urban women have improved intake but still consume 13 to 37% less.

Nutrient intake among adolescent girls in the present study was found to be inadequate. Intake of energy, iron, calcium, vitamin B1, B2, B3, and zinc was low when compared to RDA. Consumption of carbohydrates was found to be higher, whereas the intake of vitamin C, protein, fat and folate was adequate in their diet. Previous studies reported a deficient supply of energy, protein, and micronutrients such as iron, calcium, vitamin B12, folate, calcium, and zinc among Indian adolescent girls (Maliye *et al.*, 2010, Sachan *et al.*, 2013, Doustmohammadian *et al.*, 2013, Gupta *et al.*, 2018, Solanki *et al.*, 2021, Sari *et al.*, 2022).

During the COVID-19 pandemic, Vyas and Rawal, 2022 reported that the consumption of pulses, fruits, and vegetables among adolescents of the age group 12 to 14 years was found to increase and they also reported that most (81%) adolescents included milk in their diet daily which is contrary to the present study. In a representative German online survey, children, and adolescents (1–14 years old) showed an increase in healthier behaviours, such as increased fruit and vegetable consumption (Koletzko *et al.*, 2021). In a study conducted on Canadian university students, it was reported that the nutrient and caloric intake were significantly reduced during the pandemic, alcohol intake increased significantly whereas the frequency of consuming food groups across the board decreased during the pandemic (Butler and Barrientos, 2021). 10% of Belgian participants often could not afford to eat a healthy diet during the pandemic period (Pfeifer *et al.*, 2021). Fruit and vegetable consumption decreased and the consumption of soft drinks, sweets, bread and salty snacks increased (Vandevijvere, *et al.*, 2020, Huber

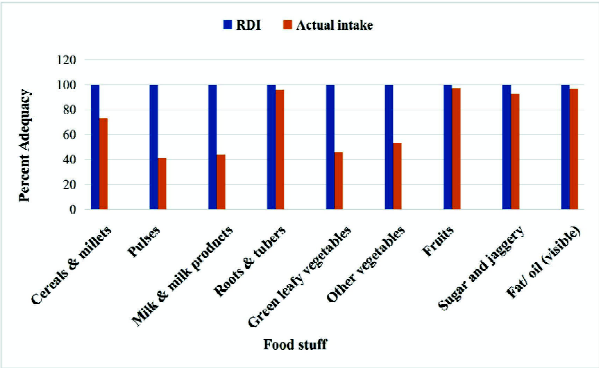

Fig. 1: Percent adequacy of food groups among adolescent girls (13-15 years)

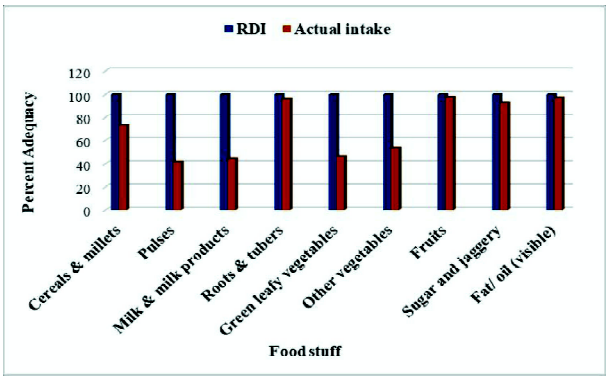

Fig. 2: Percent adequacy of food groups among adolescent girls (16-18 years)

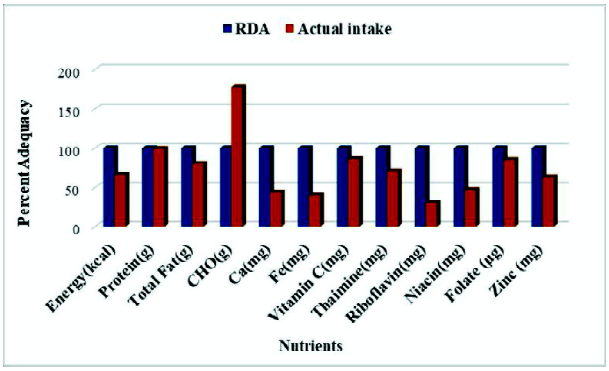

Fig. 3: Percent adequacy of nutrients among adolescent girls (13-15 years)

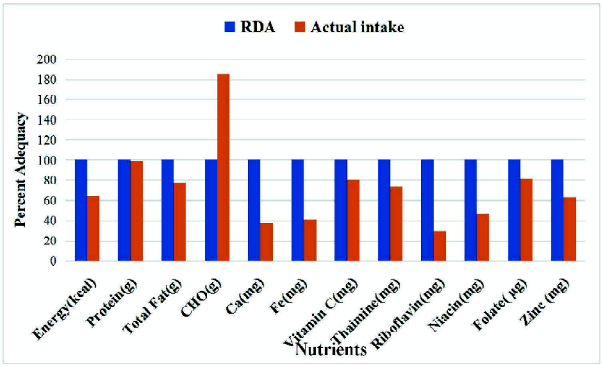

Fig. 4: Percent adequacy of nutrients among adolescent girls (16-18 years)

et al., 2020, Zarah *et al.,* 2020). Adolescents reported high consumption of food rich in energy as rice, pasta, cheese, or legumes, a lower consumption of protein than three servings per week and deficient intake of vitamins and minerals (Martín *et al.*, 2022). Previous studies among adolescents on dietary intake showed dietary inadequacy. Adolescent's dietary consumption and food choices may be influenced by a variety of factors, including household economic status, uneven intra-familial food distribution, food taboos, dietary restrictions during menstruation, peer pressure, food choices, culture, mass media, and body image perception (Melaku *et al.*, 2018, Dalky *et al.*, 2016, Ethiopian Federal Ministry of Health, 2016). COVID-19 resulted in both favorable and unfavorable changes in dietary pattern among adolescent. The present study showed better dietary intake than pre-COVID time, but during COVID, the consumption was also not up to the mark as recommended by RDI and RDA. Reasons for reduced dietary intake predominately included limited availability and increased price, and there were associations with poor food choices and mental health conditions including depression and anxiety, and sedentary time (Sidor and Rzymski, 2020).

CONCLUSION

During adolescence, adequate nutrition is a potential health factor. COVID-19 has an impact on one's lifestyle, particularly nutrition. The results of this study provided the first description of the dietary intake of adolescent girls of age groups 13 to 18 years during the outbreak period. The key findings of the study stated that dietary intake was inadequate among girls during COVID-19 which indicated inappropriate dietary consumption among adolescent girls. The impact of social isolation and the pandemic on eating behaviour during COVID-19 should not be underestimated as it has already had acute effects and will likely produce long-term deleterious effects

on health as well. It is a matter of the utmost importance to abandon the negative habits acquired by the adolescents, therefore, families of the subjects, as well as nutritional and health professionals, are urged to educate and encourage these adolescents to improve their dietary habits. Understanding the adolescent's nutritional behaviour through our study will help public health authorities to modify future regulations on adolescents' nutritional recommendations.

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