

Assessment of Nutritional Status and Nutrition Knowledge of Adolescent Girls (13-18 years) residing in urban slum areas of Jaipur city

Sameeksha Sharma¹ and Ila Joshi²

Department of Home Science, IIS (Deemed to be University), Jaipur

Abstract

Diet and nutrients have a critical position during adolescence phase of life. Poor nutrition in this period may cause growth retardation and delay in development. Optimal nutrition, particularly in the case of adolescent girls, becomes very important because of their increased nutritional requirements. Moreover, adolescent girls belonging to low marginalized communities, like slum areas, may suffer from malnutrition due to poverty, gender discrimination and other socio-cultural norms. Further, less age and young undernourished pregnant women may give birth to babies having low weight. This may lead to nutritional deficiencies and increased chances of mortality among both, child and the mother. The present research work was conducted to assess nutrition knowledge as well as nutritional status of the girls (between 13-18 years) habitant of urban slums of Jhotwara areas of Jaipur city. A sample of 65 adolescent girls (13-18 years) was selected from two slum areas in Jhotwara. Major findings of the study revealed dietary consumption of the respondents to be unsatisfactory and more than 58% subjects to be undernourished. BMI values showed no significant relation with socio-economic status and dietary habits. Most of the girls (73.3%) showed poor knowledge regarding nutrition and showed no association with BMI and age. Present findings revealed that problem of under-nutrition was very prominent in adolescent girls of urban slum area and they had poor nutrition knowledge. Thus, a need was felt for imparting nutrition education to the girls of adolescent age group. It can be done both at school and community level in order to bring a positive change in their nutritional as well as health status.

Keywords

Adolescent Girls, Adolescent Nutrition, Urban Slum, Nutritional Status, Nutrition Education

Introduction

WHO identifies adolescence from age 10 to 19 years period, which occurs after childhood and before adulthood (World Health Organization, 2015). Today, adolescents constitute 19.6% of the total population i.e. 236.5 million adolescents among a total population of 1205.6 million (census 2011). A recent national review found that adolescent age is associated with many health impacting behaviours and problems, which include under and over-nutrition, stress and anxiety as well as substance abuse; all of which are closely

linked to ongoing nutrition (Singh & Gopalkrishna, 2014). As per Viner et al. (2011), a modest level of adolescent mortality was reported, while a substantial reduction in infant and child mortality was documented since last 50 years. Even adult life is also influenced negatively due to ripple effect of poor health and risky behaviours in adolescence (Patton et al., 2016).

Nutritional status at adolescent phase is basically a mirror image nutritional status at early childhood. In developing countries many adolescents are found underweight, stunted and/or anaemic or deficient in micronutrient just because their nutritional status was not par standard during their childhood (Thurnham, 2013). In many developing countries, nearly half of the adolescent population is stunted (Black et al., 2013). Poor nutritional status during adolescence phase can lead to fatal consequences in future life. Nutritional needs are increased during adolescent specially for protein, calcium, iodine and iron. Poor nutritional status during adolescent phase is responsible for many public health issues e.g. poor birth outcomes known as intra uterine growth retardation or intra uterine death, anaemia, delayed mental development etc. (Maliye et al., 2010).

In India, it is the thrust area of research to assess nutritional status of adolescents (Shivramkrishna et al., 2011). As per UNICEF statistics that is based on the investigation of data obtained from 64 countries, 50% of adolescent girls were found underweight in India while 25% adolescent females were found underweight in other countries (United Nations Children's Fund, 2012). Presence of anaemia during adolescence is directly linked to maternal mortality. Similarly, haemoglobin level of adolescent females was reported as 11.07 g/dl in a study done by Rao et al. (2011). It was also documented that around 75% of females suffered from different types and stages of anaemia.

Under-nutrition was highly prevalent among adolescent girls as reported in a study performed in a slum area of Pune (India) along with high percentage of anaemic subjects (Joshi et al., 2019). A research work done in a slum in Uttar Pradesh (state/province in India) revealed alarmingly high rates (78.5%) of anaemia among the adolescent females (Arya et al., 2017). When causative factors were analyzed for anaemia during adolescent phase, Begum et al. (2017) revealed that residence location/ habitat, low literary status, poor economic status were the main culprits for malnutrition.

The menarche or onset of menstruation is another most important aspects of the lives of females. It may lead to school dropouts, reduced mobility and many more restrictions are imposed on girl's life in many societies that change their overall personality (Garg et al., 2012). Menstruation is the least discussed topic in society and as a result of which most of the young girls face this phase with lots of troubles and confusions as they are not prepared for it. Trauma, fear, embarrassment and a general belief of society that this is impure and dirty influence their attitude towards menstruation. Data shared by UNICEF (2012) for a study done in Uttar Pradesh (state/province in India) showed that 86% of girls were completely unprepared and 64% reported that they were scared at menarche. There is a dire need to inform young girls to be careful and vigilant about hygiene during menstruation to avoid the chances of reproductive tract infection (RTIs). Poor hygienic

practices during menstruation are major contributory factors for higher rates of RTI that is responsible for higher female morbidity (Garg et al., 2012).

Rapid urbanization in the 20th century has been accompanied by the development of slums. Slums are generally densely populated with poor hygienic conditions (Ezeh et al., 2016). These are accompanied with many issues related to water, safety, hygiene, waste management etc. These poor living conditions cause exposure of slum residents to epidemics and poor health status. Physical and mental challenges are seen more in urban slum adolescent girls in comparison to rural girls due to increasing pressure of modernization (Prashant & Shaw, 2009). They not only face under-nutrition problem, but they also have inadequate infrastructure problem because of which they do not gain proper health care during illness. They are more susceptible to nutritional deficiencies. Besides unhygienic conditions, low economic status and lack of awareness for healthy diet also contributes to malnutrition in urban slums.

Chandrakumari et al. (2019) also showed high prevalence of anaemia in girls of lower socio-economic groups than the girls from affluent societies. Parasuraman et al. (2009) highlighted various causes of anaemia. One of the most dominating factor includes 'Education'. This study also revealed role of economic status on anemia which was seen more in lower socio economic group women (22%) and men (18%) as compared to their rich counterparts (13% in women and 6% in men). Prevalence of anaemia in young girls of slum area of Uttar Pradesh (state/province in India) was found to be 78.5% which is quite high (Arya et al., 2017).

Various studies have been conducted recently to assess the nutrition related knowledge of the adolescent population. A study used the mixed method approach to identify the health needs of adolescent females residing in slums of a metropolitan city and concluded that there is a need to give information to adolescent girls regarding menstrual hygiene and issues linked to it as about 90% of them had inadequate knowledge regarding it (Kadam et al., 2019). Gap in nutrition related knowledge is a major barrier towards healthy eating behaviour. Among 250 adolescent girls belonging to low-income families of Delhi, 72% girls were observed to skip their meals (at least 1- 2) daily and approximately 34% stated that consumption of fruits and vegetables is not necessary on a daily basis (Rastogi et al., 2019). Literacy status of adolescent girls determines their access to useful nutrition related information and thereby influences their nutritional status through dietary modification.

Therefore, proper nutrition related knowledge is very important for the adolescent girls living in slum areas to overcome health and nutrition related problems.

Methodology

The proposed study was based on a cross-sectional survey design. Association between different variables was ascertained and compared. The data pertaining to the study included socio-demographic profile (age, family type, size of the family, level of education, occupation, and income), general health details, dietary pattern, anthropometric

measurements and nutritional knowledge of the adolescent girls. The slum areas selected for the study were present in Jhotwara area of Jaipur city and were selected using convenience sampling. A total of 65 adolescent girls of middle and late adolescent age group (13-18 years) were selected randomly for the study.

A pre-structured interview schedule was finalized to elicit information on profile of the slum area and family of the subject, and profile of the subject. Questions regarding profile of the slum area included questions on housing condition, sanitation facilities, availability of safe drinking water, presence of primary health centres. Information related to caste, religion, family composition, type of family, literacy level, occupation and family income was also obtained. Height and weight of the subjects were recorded and BMI was calculated and was used to assess the extent of malnutrition (WHO, 2015). The subjects were examined from head to toe for signs and symptoms of anaemia (brittle nails, pale skin, shortness of breath, sore tongue, etc). Dietary intake of the subjects was assessed using food frequency questionnaire.

A knowledge-based questionnaire was prepared and used to assess the existing knowledge of subjects regarding nutrition and hygiene. It included questions related to basics of nutrition (like nutrients, food sources, balanced diet, effect of nutrient deficiencies, cooking methods, etc.) and menstrual hygiene (menstruation basics and practices). The information was collected online from a small subgroup of 30 adolescent girls. For the interpretation of the results, the scoring was based on two options *i.e.*, correct or incorrect. The respondents were assigned one score for correct answer and none for an incorrect answer. Then total score was summarized to assess the knowledge level of the subjects. Interpretation of scores was adopted as given by Yusof et al., (2014). Data was analysed for all the variables under socio-demographic profile, anthropometric measurements, dietary intake and nutrition related knowledge. The information obtained from the subjects was compiled and statistically analysed, using SPSS version 22.

Ethics statement

Voluntary participation and maintaining confidentiality while collecting data was ascertained. Consent was taken from the parents of participants. Then the present research work was approved by the Ethics Committee of IIS (deemed to be University), Jaipur.

Results and Discussion

Slum profile

The two selected slum areas 'Barkat colony' and 'Narsingh colony' of Jhotwara area were in close proximity to each other, therefore had similar demographic and physical characteristics. Both the slum areas existed from 40 years and were spread over an area of 2-3 km. Area surrounding the slum areas was residential. Drinking water source in both

the slum areas was municipal tap. Toilets were present inside the houses of the slum residents and door-to-door waste collection facility was also available in both the slum areas. Institutions like, anganwadi centre, municipal pre-school and primary school were present within the range of 500m from the slum areas, whereas, the distance of the nearest High school from the slum areas was approximately 3-4 km. Health care facilities like public and private hospitals also lie within the range of 2 Km. Facilities like community hall, old age home, vocational training centre or any other type of non-formal education centre were not present in the mentioned slum areas. Physical observation of the slum areas showed that the slums consisted of pucca houses in majority, which was densely populated accompanied by narrow pathways and open drains. Slum residents were co-living with livestock like hens and goats.

Family profile

Around 41% of the subjects were Muslims and the rest of them (i.e. 49.2%) were Hindus. Around 85% of the subjects belonged to nuclear families and 15.3% belonged to joint families. Majority of the subjects belonged to medium family size category. Among the fathers of the respondents, 20% were metric pass while 17% were illiterate. Illiteracy level was higher in case of the mothers of the respondents as approximately 46% of them fell into this category.

With respect to the occupation of family members, 40% of the mothers of the subjects were housewives and around 51% were involved in bangle making business. Majority of the fathers of the respondents were self-employed (Table 1). Around 66% of the respondents belonged to lower-middle income group.

Work category	Father (f=65)	Mother (f=65)
Unemployed	0 (0.0)	-
Housewife	-	26 (40)
Self-employed (tutor/farmer/painter)	33 (50.77)	34 (52.3)
Petty business (vendor/shop owner)	15 (23.08)	0 (0.0)
Business (large scale)	0 (0.0)	0 (0.0)
Government job	0 (0.0)	0 (0.0)
Private job	17 (26.15)	5 (7.7)
Any other	-	-

Figures in parentheses denote percentage

Table 1: Distribution of family members of subjects according to the work category

Subject Profile

Age and educational status of the subjects

Mean age of the respondents was 14.3 ± 1.45 years. About 72% of the respondents were school going and 27.7% of them never went to school or dropped out early from school. About 17% of the girls were studying in the primary school i.e. 1st to 5th class which

shows the prevalence of late enrolment considering the age of the respondents. Around six percent of the respondents never went to school. Table 2 depicts the age and educational status wise distribution of the subjects.

S. No.	Variables	f (N=65)
Age		
1	13-14	45 (69.23)
2	15-16	14 (21.54)
3	17-18	6 (9.23)
Educational status		
1	No schooling	4 (6.1)
2	I-V	11 (17)
3	VI-VIII	42 (64.6)
4	IX-XII	8 (12.3)

Figures in parentheses denote percentage

Table 2: Age and level of educational of the subjects

Nutritional status of subjects

Mean weight of the respondents was 41.24 ± 8.47 kg and mean height of the respondents was 1.6metres. On the basis of classification of malnutrition using percentile scores given by WHO, it was found that 58.5 % of the adolescent girls were undernourished while 1.5% of them were overweight (Table 3). Another study also concluded similar trend (41.1%) of underweight girls of urban slum of Pune (Joshi et al., 2019). Height for age classification given by WHO showed that 6.1% of the respondents were stunted.

Indicator	Cut off value	13-14 years	15-16 years	17-18 years
		f (N=43)	f (N=16)	f (N=6)
Underweight	<5 th percentile	28 (43.1)	8 (12.3)	2 (3.1)
Normal	5 th -85 th percentile	15 (23.1)	7 (10.8)	4 (6.1)
Over weight	85 th -95 th percentile	0 (0.0)	1 (1.5)	0 (0.0)
Obese	≥95 th percentile	0 (0.0)	0 (0.0)	0 (0.0)

Figures in parentheses denote percentage

Table 3: Distribution of BMI categories of subjects by age

Dietary intake

Dietary assessment of respondents revealed that 40% of the respondents consumed less than 3 meals a day. Around 50% of the respondents practiced skipping the meals and 43.1% of them gave the reason of not feeling hungry for the same. Data analysis of FFQ revealed that the quality of diet pattern of majority of the respondents was unsatisfactory as daily consumption of pulses and legumes was reported only by 17% of the respondents. Cow milk was consumed daily by only 3.1% of the respondents and 15.4% of the respondents reported daily consumption of buffalo milk.

Association between nutritional status and socio-economic factors

The association of nutritional status with various socio-economic variables was found out using chi-square test. There was only 1 subject in the overweight category so the subject was not considered for the test. The findings of the chi-square test suggested that BMI values didn't showed any significant difference based on family size, family type, income group, parents' education and occupation (Table 4). A slightly higher percentage of underweight and overweight categories were observed among the Muslim girls but no significant association was seen. Similar findings were reported by another study where there was no significant association between nutritional status and factors like family type, parents' education and father's occupation (Fatima et al., 2019). However, the study reported significant association of BMI with mother's occupation and family size which were in contrast with the results of this study. Similarly, another study also reported that factors like religion, caste and family type were not linked to poor status of nutrition in adolescent girls (Rani et al., 2018).

Socio-economic variables	BMI Category		Total	p-value
	Underweight	Normal		
	f	f	f (N=64)	
Religion				
Hindu	18 (47.4)	13 (50.0)	31 (48.4)	.836
Muslim	20 (52.6)	13 (50.0)	33 (51.6)	
Total	38 (59)	26 (41)	64 (100.0)	
Caste				
General	18 (47.4)	13 (50.0)	31 (48.4)	.836
OBC	20 (52.6)	13 (50.0)	33 (51.6)	
Total	38 (59)	26 (41)	64 (100.0)	
Income group				
Low	0 (0.0)	0 (0.0)	0 (0.0)	.407
Lower-middle	24 (63.2)	19 (73.1)	43 (67.2)	

Upper-middle	14 (36.8)	7 (26.9)	21 (32.8)	
High	0 (0.0)	0 (0.0)	0 (0.0)	
Total	38 (59)	26 (41)	64 (100.0)	
Mother's Education				
Illiterate/ can read only	18 (47.4)	14 (53.8)	32 (50.0)	.405
Primary	6 (15.8)	6 (23.1)	12 (18.7)	
Secondary	14 (36.8)	6 (23.1)	20 (31.3)	
Graduate or above	0 (0.0)	0 (0.0)	0 (0.0)	
Total	38 (59)	26 (41)	64 (100.0)	
Father's Education				
Illiterate/ can read only	10 (26.3)	7 (26.9)	17 (26.6)	.198
Primary	7 (18.4)	6 (23.1)	13 (20.3)	
Secondary	15 (39.5)	13 (50.0)	28 (43.7)	
Graduate or above	6 (15.8)	0 (0.0)	6 (9.4)	
Total	38 (59)	26 (41)	64 (100.0)	
Mother's Occupation				
Housewife/ Unemployed	17 (44.7)	9 (34.6)	26 (40.6)	.618
Self-employed/ Business	21 (55.3)	17 (65.4)	38 (59.4)	
Private employee	0 (0.0)	0 (0.0)	0 (0.0)	
Total	38 (59)	26 (41)	64 (100.0)	
Father's Occupation				
Unemployed	0 (0.0)	0 (0.0)	0 (0.0)	.922
Self-employed/ Business	28 (73.7)	19 (73.1)	47 (73.4)	
Private employee	10 (26.3)	7 (26.9)	17 (26.6)	
Total	38 (59)	26 (41)	64 (100.0)	
Family Type				
Joint	7 (18.4)	6 (23.1)	13 (20.3)	.340
Nuclear	31 (81.6)	20 (76.9)	51 (79.7)	
Total	38 (59)	26 (41)	64 (100.0)	
Family Size				
less than or equal to 3	10 (26.3)	6 (23.1)	16 (25.0)	.884
More than 3	28 (73.7)	20 (76.9)	48 (75.0)	
Total	38 (59)	26 (41)	64 (100.0)	
p<0.05 is statistically significant				

Figures in parentheses denote percentage

Table 4: Socio-economic status of the study population and its association with nutritional status

Association between nutritional status and dietary habits

The findings of the chi-square value suggested no significant relation between dietary habits and state of nutrition like dietary pattern, meal pattern and fast-food consumption frequency as depicted in Table 5. A slightly higher percentage of underweight individuals were seen in persons with meal pattern of less than 3 meals a day but the association was not statistically significant. The findings also reported the proportion of underweight girls were more in the case of occasional fast-food consumption. The reason for the same is unhealthy diet of the adolescent girls and the habit of meal skipping which was observed in 51% of the respondents.

Dietary habit	BMI Category		Total	p-value
	Underweight	Normal		
	f	f	f (N=64)	
Dietary pattern				
Vegetarian	14 (36.8)	8 (31)	22 (34.4)	.881
Non-vegetarian	24 (63.2)	18 (69)	42 (65.6)	
Total	38 (59)	26 (41)	64 (100.0)	
Meal pattern				
Less than 3 meals a day	15 (39.5)	10 (38.5)	25 (39.1)	.814
3 or more than 3 meals a day	23 (60.5)	16 (61.5)	39 (60.9)	
Total	38 (59)	26 (41)	64 (100.0)	
Fast food consumption frequency				
Never/rarely	7 (18.4)	2 (7.6)	9 (14.1)	.393
Very often	15 (39.5)	12 (46.2)	27 (42.2)	
Occasionally	16 (42.1)	12 (46.2)	28 (43.7)	
Daily	0 (0.0)	0 (0.0)	0 (0.0)	
Total	38 (59)	26 (41)	64 (100.0)	
p<0.05 is statistically significant				

Figures in parentheses denote percentage

Table 5: Dietary pattern of the study population and its alliance with nutritional status

Nutritional knowledge of the adolescent girls

Poor knowledge regarding nutrition was seen in majority of girls (73%) and about 26.6% of the respondents had intermediate level of nutrition related knowledge. No one came in the

high or excellent knowledge category as shown in figure 1. The mean score of the respondents was 17.96 ± 3.96 out of 40. These findings of poor nutrition related knowledge among the adolescent girls of slums are very much in consonance with the results of other similar studies. Chaudhary et al. (2016) also concluded that the adolescent girls of the slums of Kanpur (India) were having poor knowledge regarding nutrition and dietary intake.

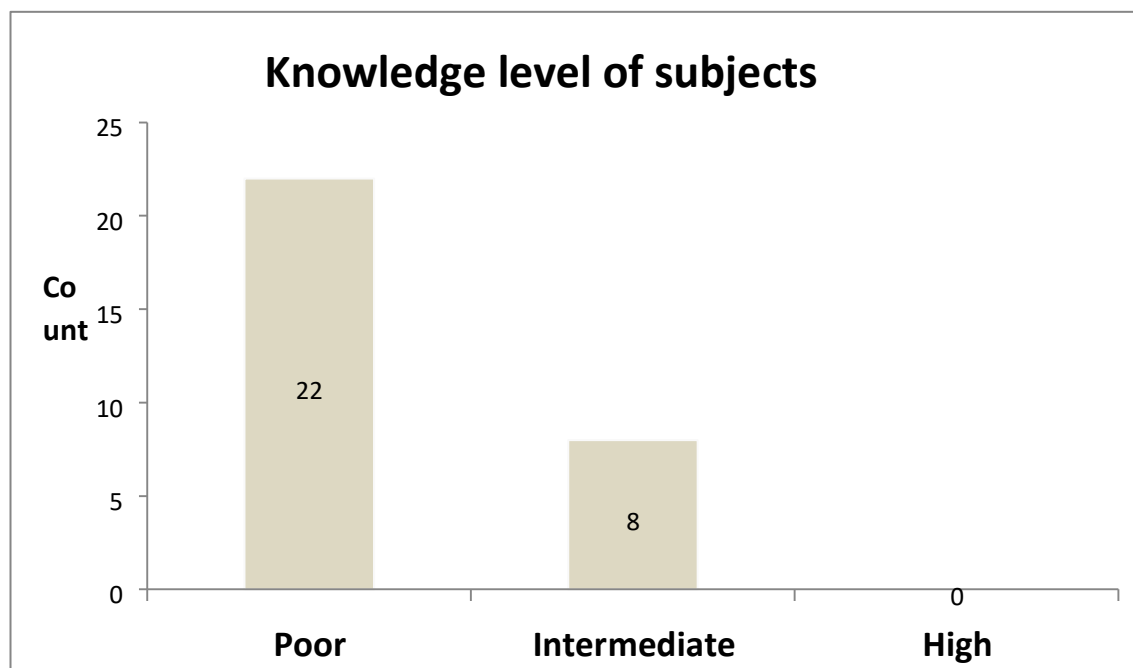


Figure 1: Distribution of subjects on the basis of knowledge level

The mean score of the respondents in the question related to foods out of 25 was 11.3 ± 2.6 . About 73% of the respondents never heard about the trans-fat and its sources. Around 90% of them didn't know about antioxidants and free radicals. Only 56% of them were aware about the sources of saturated fat in the diet, role of fibre and example of processed food. The mean score of the respondents in the questions related to health was 4.5 ± 1.65 out of 11 questions. In the questions related to nutritional deficiencies, less than 30% of the respondents were aware about the disorders related to high sugar and salt intake. Nearly 63% did not know the consequences of low fibre intake in the diet. All of them though knew about the practices involved in keeping personal hygiene. Around 97% have never heard about pasteurization and why it is done.

Association of knowledge level with BMI and age of the respondents

Association derived using Pearson's correlation showed that the relation between knowledge level and BMI was not statistically significant (Table 6). Similar results of no association between nutritional knowledge and anthropometric index were also concluded by another study (Shahsanai et al., 2018).

		BMI of the subjects	Age of the subjects
Knowledge score of the subjects	Pearson correlation	.426	-.005
	Sig. (2 tailed)	.019	.977
	N	30	30
Correlation is significant at the 0.05 level (2-tailed).			

Table 6: Pearson correlation coefficient between BMI and age with total score of nutritional knowledge

Conclusion

It was concluded that existing nutrition related knowledge was insufficient among the adolescent girls of the selected slum areas. They had very low knowledge about various aspects of nutrition like food groups, nutritional requirements of adolescents, nutritional deficiencies and anaemia. Majority of the subjects were lying under the category of under-nutrition. Adolescent girls showed poor dietary intake as a significant proportion of them reported to be taking less than three meals a day, majority of the respondents had the habit of meal skipping and they lack foods like milk, curd, paneer, pulses etc. In their daily diet. There is a need to impart nutrition education at school and community level in order to achieve better health and state of nutrition in the adolescent girls which will ultimately help them in improving their quality of life.

References

- Arya, A.K., Lal, P., Kumar, N., & Barman, S. (2017). Prevalence of anemia among adolescent girls in an urban slum of Kanpur, Uttar Pradesh. *International Journal of Medical Science and Public Health*, 6(9), 1378-1381. Doi: 10.5455/ijmsph.2017.0616928062017
- Begum, A., Sharmin, K.N., Hossain, M.A., Yeasmin, N., & Ahmed, T. (2017). Nutritional status of adolescent girls in a rural area of Bangladesh: A cross sectional study. *Bangladesh Journal of Scientific and Industrial Research*, 52(3), 221-228.
- Black, R.E., Victora, C.G., Walker, S.P., Bhutta, Z.A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., Uauy, R. (2013). Maternal and child 66 undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382 (9890), 427-51. Doi: 10.1016/S0140-6736(13)60937-X.
- Census (2011). Adolescents and youth in India. Retrieved from http://www.censusindia.gov.in/2011-Documents/PPT_World_Population/Adolescents_and_Youth_in_India_Highlights_from_Census_2011.pptx

Chandrakumari, A.S., Sinha, P., Singaravelu, S., & Jaikumar, S. (2019). Prevalence of anaemia among adolescent girls in a rural area of Tamil Nadu, India. *Journal of Family Medicine and Primary Care*, 8(4), 1414-1417.

Choudhary, A. (2016). Nutrition related knowledge of adolescent girls (14-20 Yrs.) of a slum community of Kanpur Nagar. *Periodic Research*, 4(3), 69-71.

Ezeh, A., Mberu, B., & Haregu, T. (2016, December 18). Slum Health is not urban health: why we must distinguish between the two. *The Conversation*. Retrieved from <http://theconversation.com/amp/slum-health-why-we-must-distinguish-between-thetwo-69939>

Fatima, W., Alqhatani, N.S.M., & Ahmad, L.M. (2019). Assessment of Nutritional Status and its Related Factors among Female Adolescent Girls: A School based Study in Arar city, Kingdom of Saudi Arabia. *International Journal of Medical Research & Health Sciences*, 8(2), 133-144.

Garg, R., Goyal, S., & Gupta, S. (2012). India moves towards menstrual hygiene: Subsidized sanitary napkins for rural adolescent girls- Issues and Challenges. *Maternal and Child Journal*, 16, 767-774.

Joshi, N., Kumar, M., & Chatterjee, K. (2019). Study of nutritional status of Adolescent girls from an urban slum area in Pune: a Prospective study. *International Journal of Medicine Research*, 4(1), 30-33.

Kadam, D.D., Saurabha, U.S., & Tiwari, S.C. (2019). Health needs of adolescent girls living in an urban slum of a metropolitan city- A mixed method approach. *Journal of Family Medicine and Primary Care*, 8(8), 2661-2666. Doi: 10.4103/jfmpc.jfmpc_481_19

Maliye, C.H., Deshmukh, P.R., Gupta, S.S., Kaur, S., Mehendale, A.M., & Garg, B.S. (2010). Nutrient intake amongst rural adolescent girls of Wardha. *Indian Journal of Community Medicine*, 35(3), 400-402.

Parasuraman, Sulabha, Kishor, Sunita, Kant, & Vaidehi, Y. (2009). A profile of Youth in India. National Family Health Survey (NFHS-3), India, 2005-06. Mumbai: International Institute for Population Sciences.

Patton, G.C., Sawyer, S.M., Santelli, J.S., Ross, D.A., Afifi, R., Allen, N.B., ...Viner, R.M. (2016). Our future: a Lancet commission on adolescent health and wellbeing. *Lancet*, 387(10036), 2423-2478. Doi: 10.1016/S0140-6736(16)00579-1

Prashant, K., & Shaw, C. (2009). Nutritional Status of Adolescent Girls from an Urban Slum Area in South India. *Indian Journal of Pediatrics*, 76(5), 501-504.

Rani, D., Singh, J.K., Srivastava, Verma, P., Srivastava, D. & Singh, S.P. (2018). Assessment of nutritional status of teenage adolescent girls in urban slum of Varanasi. *International Journal of Current Research and Review*, 10(20), 6-10. Doi: 10.31782/IJCRR.2018.10202

Rao, S., Joshi, S., Bhide, P., Puranik, B., & Kanade, A. (2011). Social dimensions related to anaemia among women of childbearing age from rural India. *Public Health Nutrition*, 14(2), 365-372.

Rastogi, S., Mathur, P., & Khanna, A. (2019). Gaps in nutrition knowledge and barriers to eating healthy among low-income, school-going adolescent girls in Delhi. *J Public Health*, 27, 629-636. Doi: 10.1007/s10389-018-0985-6

Shahsanai, A., Farajzadegan, Z., Sichani, Z.H., Heidari, K., & Omid, R. (2018). *Assessment of relationship between nutritional knowledge and anthropometric indices in Isfahan children and adolescent*. *Advances Biomedical Research*, 7, 110. Doi: 10.4103/abr.abr_1_18

Shivramkrishna, H.R., Deepa, A.V., & Sarithareddy, M. (2011). Nutritional status of adolescent girls in rural area of Kolar district – A cross sectional study. *Al Ameen J Med Sci.*, 4(3), 243-246.

Singh, S., & Gopalkrishna, G. (2014). Health behaviours and problems among young people in India: cause for concern and call for action. *Indian J Med Res.*, 140(2), 185– 208.

Thurnham, D.I. (2013). Nutrition of Adolescent Girls in Low and Middle Income Countries. *Sight and Life.*, 27(3).

UNICEF (2012). UNICEF Annual Report 2012, June 2013. Retrieved from http://www.unicef.org/publications/index_69639.html

Viner, R.M., Coffey, C., Mathers, C., Bloem, P., Costello, A., Santelli, J., & Patton, G. (2011). 50-year mortality trends in children and young people: a study of 50 low-income, middle-income, and high-income countries. *Lancet*, 377(9772), 1162–74.

WHO (2015). Child and adolescent health and development. Retrieved from http://www.searo.who.int/entity/child_adolescent/topics/adolescent_health/en

Yusof, A., Chia, Y.C., & Hasni, Y.M. (2014). Awareness and prevalence of mammography screening and its predictors-A cross sectional study in a primary care clinic in Malaysia. *Asian Pacific Journal of Cancer Prevention*, 15, 8095-8099. Doi: 10.7314/APJCP.2014.15.19.8095