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Research Paper

Determination of socio-economic and dietary factors influencing anaemia among the adolescent girls in Kottayam district

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■ **ABSTRACT :** Adolescence is a vulnerable period for the development of nutritional anaemia even in higher socio-economic status. Thus, the study aimed to explore in detail the incidence of anaemia among the adolescent girls of Kottayam district with reference to the socio-economic and dietary factors. The study was conducted on 500 adolescent girls (12-19 yrs) of Kottayam Taluk of Kottayam district in Kerala. Overall prevalence of anaemia was 57 per cent. More number (111, 55.0%) of the study respondents were found to have mild anaemia (10-11.9 g/dl), followed by 43.1 per cent were normal subjects ($\geq$ 12 g/dl) and severe anaemia condition was not observed among the study respondents. Family income, religion, type of family and mother's education were not significantly related to anaemia. Iron and folic acid intake showed statistically significant correlation with haemoglobin levels.

■ **KEY WORDS:** Anaemia, Adolescent girls, Socio-economic factors, Dietary factors, Haemoglobin

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According to World Health Organisation (WHO, 2011), "Adolescence, a period of transition from childhood to adulthood, is crucial in the life of human beings. Adolescence is a particularly unique period in life because it is a time of intense physical, psychological and cognitive development". According to World Health Organization, the anaemic level is where the haemoglobin level to be less than 12.0 g/dl for both adolescent girls and non-pregnant women (WHO, 2001a). Women in the childbearing age, young children, particularly adolescent girls are affected by anaemia (Gautam *et al*., 2002). The growth spurt and menstrual status affect iron stores in adolescent girls with low iron intake (Ernst *et al*., 1998). Nutritional deficiencies lead to giving birth to undernourished babies transferring the undernutrition to the next generation too (Singh *et al*., 2012). With this background the study was designed with the objective to determine the incidence of anaemia and its relationship with socio-economic and dietary factors among the adolescent girls of Kottayam district.

■ RESEARCH METHODS

Definition of terms :

Anaemia:

According to the World Health Organization (WHO, 1997), anaemia is defined as a haemoglobin level

of less than 12 g/dL in women.

Socio-economic factors:

Socio-economic factors in the current study refers to social and economic factors which can influence haemoglobin status like monthly family income, type of family, Religion, Mothers educational status.

Dietary factors :

In this study dietary factors include nutrition and diet related aspects like type of diet, iron intake and folic acid intake.

Sampling:

On the basis of sample determination equation five hundred adolescent girls between the age of 12-19 years were selected from Kottayam Taluk area. Multistage random sampling was the technique adopted for sample selection. Out of the 500 adolescent girls selected a sub-sample of 202 subjects were selected for screening of anaemia based on the following criteria.

Inclusion criteria:

– Those who are in the late adolescent age group (17-19 years)

– Who were willing to participate and permitted by their parents to take blood sample.

In addition, 150 adolescent girls were selected for detailed dietary assessment, based on their willingness to participate in 24-hour recall and to respond to food frequency questionnaire.

Justification of sampling :

Late adolescence, being close to the reproductive phase of a woman's life, is very significant. Nutritional status during late adolescence thus, requires immediate attention and appropriate interventions.

Tools and techniques :

A semi-structured interview schedule was used to collect data from the respondents on socio-economic background and dietary pattern. The same was pre tested among 20 adolescent girls, not involved in the study, which were later excluded from the actual study. After the pre test appropriate changes were made in the survey instrument.

The biochemical parameters assessed were (a) Haemoglobin (Cyanmethymoglobin method), (b) Serum iron (Spectrophotometry) (c) Serum folic acid (Microbiological assay using Lactobacillus casei) and (d) Vitamin B_{12} (Microbiological assay using Euglena gracilis).

Direct interview method was adopted for the data collection. The researcher explained each item of the schedule and the responses were recorded accordingly. Written consent was obtained from adolescent girls and their parents before blood collection. 5ml of venous blood was drawn using a disposable syringe from 202 adolescent girls with the help of trained lab technicians and 1 ml of the sample used for measuring haemoglobin levels using Cyanmethemoglobin method. Which revealed that 115 subjects were anaemic. Further serum iron, serum folic acid and vitamin B_{12} levels were analysed for these 115 anaemic adolescent girls. In order to assess the frequency of consumption of nutritious foods and actual nutrient consumption twenty-four-hour recall and food frequency questionnaire were administered among a sub-sample of 150 adolescent girls (17-19 years). The statistical software SPSS version 17 was used for the data analysis.

■ RESEARCH FINDINGS AND DISCUSSION

The total percentage of anaemia of adolescent girls under study was 57 and it is significantly higher percentage with a mean haemoglobin level of 11.7g/dl. As per the anaemia classification of WHO (1989) only 43.06 per cent of the subjects had normal haemoglobin levels ($\geq$12 g/dl). Mild anaemia was seen among 55 per cent of the subjects (10-11.9 g/dl), whereas, only 1.9 per cent of the subjects had moderate anaemia (7-9.9 g/dl). Severe anaemia (<7g/dl) was not observed among the study respondents. These results support the UNICEF (2011) data in which the prevalence of anaemia in adolescent girls was estimated at 56 per cent.

The respondents under this present study had an average Hb level of 11.7 g/dl, a little below the normal range. Serum iron level was found to be well below (25.69 µg/dl) the normal range (35-150 µg/dl) indicated by Monson *et al*. (2002). Also the serum folic acid level was found to be well below (2.5 ng/ml) the normal range (3-17 ng/ml) prescribed by Ashraf *et al*. (2008), whereas vitamin B_{12} status of the subjects found satisfactory with a mean of 359.2 pg/ml. Hence, it has been concluded that haemoglobin, serum iron and serum folic acid levels

Table 1 : Haemoglobin, serum iron, serum folic acid and vitamin B_{12} levels of adolescent girls (n=115)

Parameters	Present study	Normal range
Haemoglobin (g/dl)	11.7± 0.88	≥12g/dl**
Serum iron (µg/dl)	25.69 ± 4.82	35-150µg/dl♦
Serum folic acid levels (ng/ml)	2.54 ± 0.45	3-17ng/ml*
Vitamin B_{12} (pg/ml)	359.2±106.6	200-960 pg/ml•

*Ashraf *et al*. (2008) • WHO (1968)
**WHO (2001b) ♦Monson *et al.* (2002)

measured for the anaemic girls in the study were below the respective average levels indicated (Table 1).

Nutrient consumption of adolescent girls :

The intake of all the nutrients except protein, fat and calcium was significantly lower (P<0.01) than Recommended Dietary Allowance (ICMR, 2004) among the adolescent girls. It was found that the consumption of energy, iron, vitamin C and folic acid did not meet the RDA. Iron intake of adolescent girls between the age group of 17 to 19 was remarkably low with percentage around 55. Vitamin C intake reported the least percentages, *i.e*. 55.6 per cent for age 17 and 18 and 41.2 per cent for age 19. These findings were coinciding with the study conducted by Parimalavalli and Sangeetha (2011). Intake of nutrients such as proteins, fat, calcium, iron and vitamin C were found to be significantly far below the RDA among selected government school girls.

Anaemia and socio-economic factors :

Correlation between income and Hb level was examined by applying Pearson's r-correlation test and it has been concluded that household income did not have any significant influence on the respondents' haemoglobin level. But Karaoglu *et al*. (2010) identified income level as a predictor of anaemia among the family members, especially children.

Based on the results output of Kruskal-Wallis test, it has been concluded that there has been no statistically significant difference in the level of incidence of anaemia between respondents belonged to Hindu, Christian or

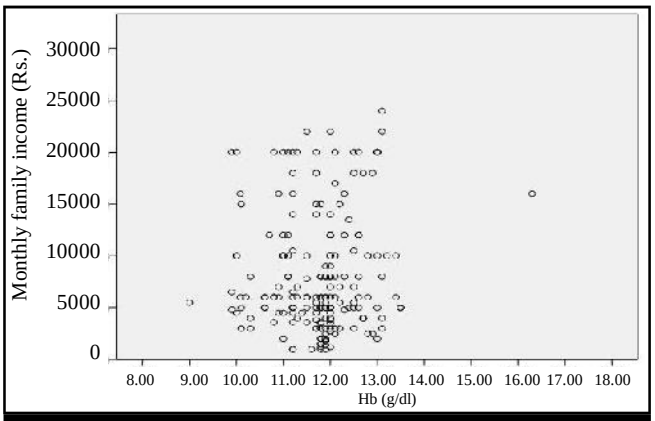

Fig. 1 : Correlation between family income and incidence of anaemia

Muslim religious groups (Table 2). The same result has been found in other studies too. No significant difference in anaemia prevalence was found by Dutt *et al*. (2009) between Hindu and Muslim faith adolescent girls in rural area of Raigad district, Maharashtra.

According to the results of Kruskal-Wallis test results, it has been concluded that there has been no significant association between the different educational level of the mothers and the incidence of anaemia among their adolescent female children. According to Abuya *et al*. (2012), maternal education has been connected with nutrition outcomes among children in studies in different settings.

Based on the results of the Mann-Whitney U-test, it has been concluded that there is no statistically significant difference in the incidence of anaemia

Table 2 : Difference in the level of anaemia incidence between the three religious groups

Religion	Number	Percentage of incidence				Result
		Normal (≥12g/dl)	Mild anaemia (10-11.9 g/dl)	Moderate anaemia (7-9.9 g/dl)	Severe anaemia (<7g /dl)	
Hindu	112(55.4%)	46(22.8%)	64(31.7%)	2(1.0%)	0(0%)	$\chi^2 = 0.464$
Christian	68.0(33.7%)	32(15.8%)	34(16.8%)	2(1.0%)	0(0%)	$p = 0.793$
Muslim	22 (10.9%)	9 (4.5%)	13(6.4%)	0(0%)	0(0%)	df = 2
Total	202(100%)	87(43.1%)	111(55.0%)	4(2.0%)	0(0%)	

Table 3 : Association between mother's educational attainment and the adolescent's anaemia

Educational level of mothers	Number	Percentage of incidence				p-value
		Normal (≥12 g/dl)	Mild anaemia (10-11.9 g/dl)	Moderate anaemia (7-9.9 g/dl)	Severe anaemia (<7 g/dl)	
Upto 10th Std	17(8.4%)	8 (4.0%)	9 (4.5%)	0 (0%)	0(0%)	$\chi^2 = 0.334$
10th Passed	79(39.1%)	32(15.8%)	46(22.8%)	1(0.5%)	0(0%)	P = .953
12th Passed	70(34.7%)	31(15.3%)	37(18.3%)	2(1.0%)	0(0%)	df = 3
Graduation and above	36(17.8%)	16(7.9%)	19(9.4%)	1(0.5%)	0(0%)	
Total	202(100%)	87(43.1%)	111(55.0%)	4(2.0%)	0(0%)	

Table 4 : Incidence of anaemia and type of family

Type of family	Number	Percentage of incidence				Result
		Normal (≥12g/dl)	Mild anaemia (10-11.9 g/dl)	Moderate anaemia (7-9.9 g/dl)	Severe anaemia (<7 g/dl)	
Joint family	28(13.9%)	13(6.4%)	14(6.9%)	1(0.5%)	0(0%)	U =2368.5
Nuclear family	174 (86.1%)	74(36.6%)	97(48.0%)	3(1.5%)	0(0%)	Z = -.271
Total	202 (100%)	87(43.1%)	111(55.0%)	4 (2.0%)	0(100%)	p = 0.787

Table 5 : Difference in incidence of anaemia between the three different dietary groups

Dietary habit	Number	Percentage of incidence				Result
		Normal (≥12 g/dl)	Mild anaemia (10-11.9 g/dl)	Moderate anaemia (7-9.9 g/dl)	Severe anaemia (<7g/ dl)	
Vegetarian	11(5.4%)	6 (3.0%)	5(2.5%)	0(0%)	0(0%)	$\chi^2 =$
Non-vegetarian	65(32.2%)	29(14.4%)	32(15.8%)	4(2.0%)	0(0%)	0.706
Non-vegetarian but often take vegetarian food	126(62.4%)	52(25.7%)	74(36.6%)	0(0%)	0(0%)	$p = 0.703$
Total	202(100%)	87(43.0%)	111(55.0%)	4(2.0%)	0(100%)	df = 2

between the joint and nuclear family adolescent girls. More studies have proved that family structure is a substitute for the process variables that specifically impact children's well-being and health (Emery *et al*., 1985, Block *et al*., 1988 and Singh and Singh, 2016).

Anaemia and dietary factors :

Based on the Kruskal-Wallis test results, it has been concluded that there is no statistically significant difference in the incidence of anaemia between the three dietary groups compared. In a study by Basu *et al*. (2005) prevalence of anaemia in adolescent girls was found to be related to nutritional status and food habits. Sharma *et al*. (2003) and Singh and Kumari (2015) in their study concluded different types of dietary habits were found to have no effect on the prevalence of anaemia

Based on the Pearson's r-correlation test results, it has been concluded that there is a strong, positive and statistically significant correlation between iron intake and haemoglobin level, *i.e*. iron intake improves haemoglobin level. The same result has been established by a number of studies. Siddharam *et al*. (2011) and

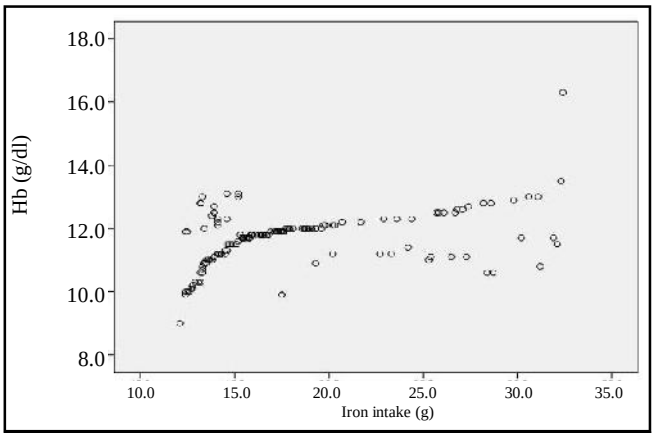

Fig. 2 : Correlation between incidence of anaemia and iron intake

Ramzi *et al*. (2011) in their study found that after weekly supplementation with iron-folic acid tablets, the prevalence was diminished by 20.5 per cent.

Based on the Pearson's r-correlation test results, it has been concluded that there is a very strong, positive and statistically significant correlation (r = .754, p = .000) between folic acid intake and haemoglobin level,

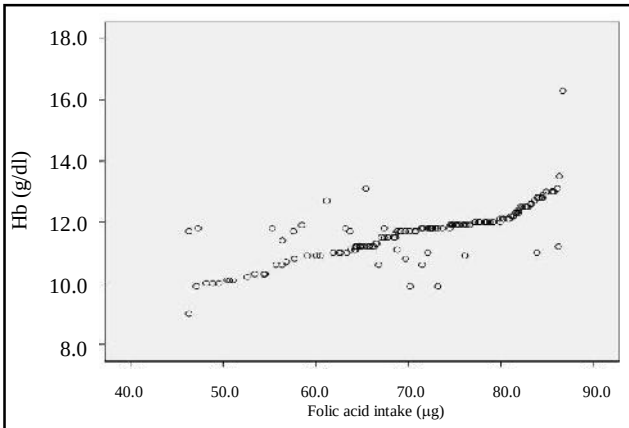

Fig. 3 : Correlation between folic acid intake and incidence of anaemia

i.e. folic acid intake improves haemoglobin level. The findings of Sen and Kanani (2012) and Chaudhary and Dhage (2008) also confirmed that IFA supplementation significantly improved haemoglobin.

Conclusion :

The current study establishes that anaemia is prevalent even among higher income and educated segments of the population in Kottayam distict particularly. The results of the present study is par with the previous studies that irrespective of socio-economic and educational background, diet and nutrition play a crucial role in maintaining good health for adolescent girls. Findings of this study will further contribute to the existing literature on adolescent nutrition related health problems in Kerala. To add on to strenghten the literature further longitudinal studies in the similar area is essential to identify the causative factors for poor growth throughout the period of adolescence among females.

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