PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

OPEN ACCESS Pakistan Journal of Nutrition

ISSN 1680-5194
DOI: 10.3923/pjn.2019.171.177

Research Article
Relationship Between Expenditures for Food Purchasing and Adolescent Anemia in Indonesia

Ratu A.D. Sartika, Isna A. Fajarini and Lia Fitrianingsih

Department of Public Health Nutrition, Faculty of Public Health, Universitas Indonesia, Depok, West Java, Indonesia

Abstract

Background and Objective: Anemia associated with nutritional deficiency in adolescents is a public health problem that continues to be a concern in developing countries, including Indonesia. The rate of adolescent anemia is increasing and can lower productivity. This study aimed to determine whether differences in expenditures for iron-rich food and residence in rural or urban areas is related to the prevalence of anemia in adolescents aged 15-19 living on Sumatera Island, Indonesia. **Materials and Methods:** A cross-sectional approach was used to analyze data from the Indonesian Family Life Survey that was administered to 731 adolescents by the RAND Corporation in 2007. **Results:** In 2007 adolescents living on Sumatera island had an average hemoglobin level of 13.96±1.86 g dL^{-1} (Girls: 12.7±1.48 g dL^{-1}, Boys: 15.1±1.56 g dL^{-1}) and the overall anemia prevalence was 11.7% (Girls: 26.1%, Boys: 2.4%). The highest level of family expenditure for food purchasing was for fresh fish [15,000±31,765.38 Indonesian Rupiah (IDR)]. Expenditures for meat, poultry, vegetables, fruit, eggs and milk were significantly lower in rural areas compared to urban areas ($p<0.05$), whereas those for fresh and dried fish were significantly lower in urban areas ($p<0.05$). Anemia was significantly associated with sex [$p<0.001$; OR = 14.55 (7,2129,37)] and consumption frequency of red meat [$p = 0.034$, OR = 2.44 (1.11-5.35)] but not with expenditures for iron-rich foods. **Conclusion:** Expenditures for food purchasing by families in Sumatera Island, Indonesia vary based on food type and area of residence (rural vs. urban). Food expenditure was not associated with the frequency of adolescent anemia. Overall, in this study anemia was more prevalent among female adolescents, adolescents living in rural areas and adolescents who consumed less red meat.

Key words: Adolescent, anemia, food expenditure pattern, iron-rich food consumption, rural population, urban population

Received: July 15, 2018 Accepted: October 23, 2018 Published: January 15, 2019

Citation: Ratu A.D. Sartika, Isna A. Fajarini and Lia Fitrianingsih, 2019. Relationship between expenditures for food purchasing and adolescent anemia in Indonesia. Pak. J. Nutr., 18: 171-177.

Corresponding Author: Ratu A.D. Sartika, Department of Public Health Nutrition, Faculty of Public Health, Universitas Indonesia, Depok, West Java, Indonesia

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Anemia in adolescents remains a public health problem in many developing countries, including Indonesia. In Indonesia through 2005, the prevalence of anemia in women of child bearing age was 33.1% and according to World Health Organization (WHO) anemia in Indonesia is a moderate public health problem[1]. The prevalence of anemia differ between urban and rural areas. Basic public health research showed that in Indonesia in 2013 the prevalence of anemia in women of child bearing age was slightly higher for women living in rural areas compared to those in urban areas (23 vs. 22.4%) but the difference was more significant for men (Rural: 18.5%; Urban: 14.5%)[2]. Despite various interventions to lower the rate of anemia in adolescents, the persistence of high anemia rates continues to be a major public health concern in Indonesia.

Several studies highlighted that anemia in adolescents is associated with reduced ability to concentrate in a school setting, decreased fitness levels and growth disorders[3]. An overall decrease in the level of productivity by adolescents with anemia may hamper social and economic development of the country[3-4]. Moreover, anemia in pregnant adolescents increases the likelihood of low birth weight and premature birth[5]. Thus, anemia can affect not only the present generation but also several subsequent generations.

An important factor that is significantly related to anemia is the amount of family food expenditure[6]. Anemia is more prevalent in families that have lower levels of expenditure for food purchasing and these families frequently live in rural areas. A low level of expenditure for food purchasing indicates low purchasing power and inadequate food consumption, which can lead to malnutrition and anemia in adolescents[7]. However, data concerning how family expenditures relate to anemia are limited. This study aimed to examine whether family expenditure patterns for iron-rich foods as well as differences in food-related expenditures by families living in rural and urban areas is related to the prevalence of anemia in adolescents. This study provides information concerning how expenditures for iron-rich foods made by urban and rural families could guide the development of public health policy to address food insecurity associated with anemia.

MATERIALS AND METHODS

This cross-sectional study used data from the Indonesian Family Life Survey (IFLS) conducted by the RAND Corporation. The data were collected in 2007 for several selected provinces on Sumatera Island. The research population was 860 adolescents aged 15 and 19 years-old who lived in the targeted provinces during the data collection period. For this study, 731 adolescents were included whose complete data for hemoglobin levels were available.

Independent variables that were considered included: individual characteristics (sex, age, nutritional status, BMI for age, living area), socio-demographic characteristics (job status of the head of household),consumption frequency of iron and vitamin C rich foods [meat, green vegetables, fruits (papaya, mangos, bananas), eggs, fish] and expenditures for food purchasing (meat, vegetables, fruits, poultry, fresh fish, preserved fish, preserved meat, tofu and *tempeh*, eggs and milk). Standardized procedures were applied to measure body weight and height to obtain BMI[8]. Data for individual and socio-demographic characteristics were collected through interviews using the questionnaire "US1" and "BUKU K"[9]. Food consumption frequency was assessed through interview using the Food Frequency Questionnaire. Data regarding expenditure for food purchasing were obtained through interviews using the questionnaire "BUKU I".

Anemia was determined based on hemoglobin levels (Hb) measured by trained personnel using Hemocue. Respondents having Hb <12 g dL^{-1} were declared to have anemia. Nutrition levels were categorized into "normal", "wasted and severely wasted" and "overweight and obese" based on the Anthropometric Standard of The Ministry of Health of Republic Indonesia[10]. The age of adolescent was categorized as "middle adolescents" (15-16 years old) and "late adolescents" (17-19 years old). The job status of household head was categorized into "not-working" and "working". Living area was classified into "urban" and "rural". Consumption frequency within the previous week was categorized as "not often" (<3 days/week) and "often" (≥3 days/week). Expenditure levels for food were categorized as "low expenditure" (<median) and "high expenditure" (≥median). Family purchasing expenditures encompassed all expenses of families for food purchasing during the week prior to data collection and the values are given in Indonesian Rupiah (IDR).

Univariate analysis was performed for all variables and bivariate analyses concerned relationships between variables and anemia and food expenditures with living areas using chi-square. Associations having a p-value ≤0.05 were considered significant.

RESULTS

Prevalence of anemia: The average Hb levels for adolescents aged 15-19 years-old living in selected provinces of Sumatera

Table 1: Data distribution of Anemia, BMI and other variable

Variables	No.	Mean	Median	SD	Min-Max
Hb Levels (g dL^{-1})	731	13.0,96	14.000	1.86	6.60-18.60
BMI (Z score)	726	-0.430	-0.430	1.11	-4.38-4.67
Meat expenditure (beef. Pork. etc) (IDR)	859	6.551,22	0.000	18.133,02	0-150.000
Poultry expenditure (chicken. duck. etc) (IDR)	859	12.910,94	0.000	29.091,52	0-540.000
Vegetables expenditure (IDR)	859	15.837,30	10.000	59.416,21	0-999.998
Fruits expenditure (IDR)	859	15.484,86	6.500	53.840,79	0-1.007.999
Legumes and nuts expenditure (IDR)	859	2.609,72	0.000	7.395,51	0-150.000
Fresh fish expenditure (IDR)	859	24.225,49	15.000	31.765,38	0-240.000
Dried fish expenditure (IDR)	859	5.684,05	3.000	9.920,29	0-109.000
Preserved meat expenditure (beef jerky. Meat floss. etc) (IDR)	859	2.041,68	0.000	7.130,92	0-143.500
Tofu and tempe expenditure (IDR)	859	6.427,01	5.000	10.727,28	0-252.000
Eggs expenditure (IDR)	859	11.042,31	7.000	42.196,50	0-999.998
Milk expenditure (IDR)	859	10.066,47	0.000	22.887,94	0-320.000

*IDR: Indonesian Rupiah, SD: Standard deviation, Min: Minimum, Max: Maximum

were 13.96±1.86 g dL^{-1} (Girls 12.7±1.48 g dL^{-1}, Boys 15.1±1.56 g dL^{-1}). The overall prevalence of anemia in these adolescents was 11.7% (Girls 26.1%, Boys 2.4%) (Table 1).

Individual characteristics: Among the individual characteristics considered, the prevalence of anemia was higher for female than male adolescents (OR 14.55 (7.21-29.37; p<0.0005) (Table 2). Although not significantly related, anemia tended to occur most frequently in "middle adolescents" (14.3%) and adolescents who had a nutritional status of "overweight and obese" (21.5%). The Z score for the average BMI of the respondents was -0.43 (-4.38-4.67).

Socio-economic status: A bivariate test did not show a significant relationship between job status of head of households and anemia (p>0.05). The anemia rate was higher for adolescents whose family head had the job status "employed" (12.2%).

Food consumption frequency: Adolescents experiencing anemia consumed meat less frequently than did adolescents without anemia (p<0.05, OR = 2.438 (1.112-5.345)). However, there was no significant relationship between frequencies of green vegetable, fruit, eggs and fish consumption and adolescent anemia.

Expenditures for food purchasing: Levels of expenditures for food purchasing varied depending on food type and area of residence. The median for the highest expenditure was for fresh fish (15,000.00 IDR; range 0-31,765.38), whereas the median for the lowest expenditure was for purchasing of legumes and nuts, meat, poultry, preserved meat and milk (0 IDR). Bivariate analyses showed no significant relationship between levels of expenditure for purchasing of meat, vegetables, fruits, poultry, fresh fish, preserved fish, preserved meat, tofu and *tempeh*, eggs and milk and the rate of anemia in adolescents in Sumatera (p>0.05).

Living areas: The prevalence of anemia was higher for adolescents living in rural areas compared to those living in urban areas (16.6 vs. 10.4%; p<0.05). Families living in rural areas had lower levels of expenditure for purchasing of meat, poultry, vegetables, fruit, eggs and milk than did families living in urban areas, whereas rural families had higher expenditures for fresh and preserved fish than did urban families (p<0.05; Table 3).

DISCUSSION

The overall average of Hb levels among adolescents living in Sumatera in 2007 was classified as normal (13.96±1.86 g dL^{-1}), as was the average based on sex (Girls: 12.7±1.48 g dL^{-1}, Boys: 5.1±1.56 g dL^{-1}). The prevalence of anemia in 2007 for Sumatera Island was 11.7% (Girls: 26.1, Boys: 2.4%). Based on WHO[1] classification, this overall rate of anemia can be categorized as a mild public health problem, however, for girls anemia is a moderate public health problem. Notably, the prevalence of anemia in adolescents on Sumatera Island did not significantly differ from that on Java Island (Overall: 16.6%, Girls: 26.4%; Boys: 5.9%).

This study found a significant relationship between anemia and sex but not age or nutrition. Girls had a 14.55 times higher risk of anemia, which is due in part to physiological factors such as menstruation[5]. The prevalence of anemia in middle adolescence (14.3%) and late adolescence (13.5%) was similar and likely reflects the high rate of growth during both periods when demands for nutrients including iron and protein are relatively high. Anemia prevalence

Table 2: Proportion differences of anemia based on food consumption frequency, food purchasing expenditures and other variables

	Anemia		Tidak Anemia				
Variables	No.	Percentage	No.	Percentage	Total No.	p-value	OR (CI 95%)
Sex							
Female	92	26.1	260	73.9	352	0.000*	14.55
Male	9	2.4	370	97.6	379		(7.21-29.37)
Age							
Middle adolescents	43	14.3	258	85.7	301	0.843	1.069
Late adolescents	58	13.5	372	86.5	430		(0.69-1.64)
Nutritional status BMI for age							
Normal	3	6.4	46	93.9	47		
Wasted and severely wasted	83	13.6	527	86.4	610	0.157	0.433 (0.131-1.426)
Overweight and obese	14	21.5	51	78.5	65	0.083	0.574 (0.304-1.083)
Living area							
Rural	67	16.6	337	83.4	404	0.021*	1.713
Urban	34	10.4	293	89.6	327		(1.102-2.664)
Family head job status							
Not working	7	7.5	86	92.5	93	0.268	0.585
Working	52	12.2	374	87.8	426		(0.257-1.333)
Meat consumption frequency							
Not often	47	16.3	241	83.7	288	0.034*	2.438
Often	8	7.4	100	92.6	108		(1.112-5.345)
Green vegetables consumption frequency							
Not often	4	26.7	11	73.3	15	0.147	2.278
Often	95	13.8	595	86.2	690		(0.711-7.299)
Fruits consumption frequency							
Not often	39	15.5	212	84.5	251	0.336	1.342
Often	27	12.1	197	87.9	224		(0.792-2.275)
Eggs consumption frequency							
Not often	36	14.6	210	85.4	246	0.590	1.185
Often	35	12.6	242	87.4	277		(0.718-1.955)
Fish consumption frequency							
Not often	24	13.7	151	86.3	175	0.987	1.041
Often	51	13.2	334	86.8	385		(0.618-1.754)
Meat expenditure levels							
Low expenditure (≤IDR 6.550)	93	14.6	544	85.4	637	0.151	1.838
High Expenditure (>IDR 6.550)	8	8.5	86	91.5	94		(0.862-3.918)
Vegetables expenditure levels							
Low expenditure (≤IDR 10.000)	71	15.7	382	84.3	453	0.081	1.536
High expenditure (>IDR 10.000)	30	10.8	248	89.2	278		(0.974-2.424)
Fruit expenditure levels							
Low expenditure (≤IDR 6.500)	66	14.0	404	86.0	470	0.900	1.055
High expenditure (>IDR 6.500)	35	13.4	226	86.6	261		(0.679-1.640)
Poultry expenditure levels							
Low expenditure (≤IDR 12.900)	69	14.5	406	85.5	475	0.519	1.190
High expenditure (>IDR 12.900)	32	12.5	224	87.5	256		(0.759-1.865)
Fresh fish expenditure levels							
Low expenditure (≤IDR 15.000)	95	14.1	578	85.9	673	0.548	1.424
High expenditure (>IDR 15.000)	6	10.3	52	89.7	58		(0.595-3.408)
Dried fish expenditure levels							
Low expenditure (≤IDR 3.000)	56	14.0	343	86.0	399	0.936	1.041
High expenditure I (>IDR 3.000)	45	13.6	287	86.4	332		(0.682-1.589)
Preserved meat expenditure levels							
Low expenditure (≤IDR 2.000)	84	14.0	517	86.0	601	0.897	1.080
High expenditure (>IDR 2.000)	17	13.1	113	86.9	130		(0.617-1.890)
Tofu and tempe expenditure levels							
Low expenditure (≤IDR 5.000)	62	14.1	379	85.9	441	0.901	1.053
High expenditure (>IDR 5.000)	39	13.4	251	86.6	290		(0.684-1.620)
Eggs expenditure levels							
Low expenditure (≤IDR 7.000)	64	14.4	380	85.6	444	0.636	1.138
High expenditure (>IDR 7.000)	37	12.9	250	87.1	287		(0.736-1.758)
Milk expenditure levels							
Low expenditure (≤IDR 6.550)	81	13.8	508	86.2	589	1.000	0.973
High expenditure (>IDR 6.550)	20	14.1	122	85.9	142		(0.574-1.649)

*Significantly correlated (p<0.05)

Table 3: Proportion differences of food purchasing expenditure levels among urban and rural adolescents

	Rural		Urban				
Variables	No.	Percentage	No.	Percentage	Total No.	p-value	OR (CI 95%)
Meat expenditure levels							
Low expenditure (≤IDR 6.550)	428	89.5	320	84.0	748	0.021*	1.632
High expenditure (>IDR 6.550)	50	10.5	61	16.0	111		(1.093-2.437)
Poultry expenditure levels							
Low expenditure (≤IDR 12.900)	340	71.1	224	58.8	564	0.000*	1.727
High expenditure (>IDR 12.900)	138	28.9	157	41.2	295		(1.300-2.294)
Vegetables expenditure levels							
Low Expenditure(≤ IDR 10.000)	316	66.1	216	56.7	532	0.006*	1.490
High Expenditure (>IDR 10.000)	162	33.9	165	43.3	327		(1.129-1.966)
Fruit expenditure levels							
Low expenditure (≤IDR 6.500)	343	71.8	208	54.6	551	0.000*	2.113
High expenditure (>IDR 6.500)	135	28.2	173	45.4	308		(1.592-2.806)
Fresh fish expenditure levels							
Low expenditure (≤IDR 15.000)	422	88.3	368	96.6	790	0.000*	0.266
High expenditure (>IDR 15.000)	56	11.7	13	3.4	69		(0.143-0.495)
Dried fish expenditure levels							
Low expenditure (≤IDR 3.000)	228	47.7	233	61.2	461	0.000*	0.576
High expenditure I (>IDR 3.000)	250	52.3	148	38.8	398		(0.441-0.761)
Preserved meat expenditure levels							
Low expenditure (≤IDR 2.000)	397	83.1	306	80.3	703	0.344	1.201
High expenditure (>IDR 2.000)	81	16.9	75	19.7	156		(0.849-1.701)
Tofu and tempe expenditure levels							
Low expenditure (≤IDR 5.000)	295	61.7	222	58.3	517	0.339	1.155
High expenditure (>IDR 5.000)	183	38.3	159	41.7	342		(0.877-1.520)
Eggs expenditure levels							
Low expenditure (≤IDR 7.000)	319	66.7	202	53.0	521	0.000*	1.778
High expenditure (>IDR 7.000)	159	33.3	179	47.0	338		(1.348-2.345)
Milk expenditure levels							
Low expenditure (≤IDR 6.550)	397	83.1	280	73.5	677	0.001*	1.768
High expenditure (>IDR 6.550)	81	16.9	101	26.5	182		(1.271-2.459)

based on nutritional status did not significantly differ, although anemia was more common in "overweight and obese" adolescents (21.5%) compared to "normal" adolescents (6.4%) and "wasted and severely wasted" adolescents (13.6%). This proportion difference could be due to inflammatory activity of adipose tissue and subsequent reduction in iron usage by the body[11].

This study found a significant relationship between living area and anemia[12,13]. Anemia was more prevalent for adolescents living in rural areas (16.6%) compared to those living in urban areas (10.4%), although both rates constitute a moderate public health problem as defined by WHO[1]. The higher prevalence of anemia in rural areas is associated with a low frequency of meat consumption in these areas that could be related to lower family income and consequent purchasing power relative to urban families[14]. Other factors that could be related to the higher proportion of anemia in rural adolescents are lower socio-economic status, limited access to health services and lower levels of knowledge[15].

This study considered the relationships between frequency of consumption of iron- and vitamin C-rich foods by adolescents in the week prior to survey data collection. Low rates of meat consumption constituted an anemia risk factor, because meat is a significant source of iron and vitamin B_{1212}. The groups who responded "not often" for meat consumption were 2.4-fold more likely to suffer anemia than those who responded that they "often" consumed meat. In contrast, there was no significant relationship between anemia and consumption of other iron-rich foods, although those study subjects who responded "not often" to questions concerning frequency of green vegetables, fruit, eggs and fish consumption tended to have higher proportion of anemia.

The highest median food expenditure was for fresh fish and vegetables, followed by eggs (Table 1). This result was consistent with survey results obtained for the Expenditure for Consumption of Indonesian Population[16], which showed that, after grains, average expenditures were highest for fish, vegetables and eggs, respectively. The average expenditures of respondents for vegetables, fruits, fish, eggs and milk were higher than the national per capita rates for Indonesia in 2007, whereas expenditures for meat slightly differed only and those for nuts were lower[16]. The lowest median expenditure (Rp 0)

was for purchasing of legumes, meat, poultry, preserved meat and milk, although this low value could be because purchasing in only the previous week was considered and thus families may not have consumed those foods in that particular week or were consuming foods that were available from their own harvest.

A significant difference in food expenditures was seen between respondents living in urban and rural areas. Urban families had a higher prevalence of "high expenditure" for purchasing of meat vegetables, fruit, poultry, eggs and milk. This result was in accordance with results of the National Socio Economics Survey of Indonesia conducted in 2017 that was related to the Expenditure for Indonesian Population Consumption study, which showed that urban families had higher food expenditure in the form of animal foods and vegetables[17]. In developing countries, disparities in expenditures for food purchasing were related to higher food prices and income levels in urban areas[18]. The lower average expenditure for families in rural areas could be due to consideration of only total money spent on food purchases, since families in rural communities can obtain food from their own harvests. Relative to other food sources, rural families were more likely to respond "high expenditure" for fresh fish and preserved fish since fish is an affordable alternative protein source in rural areas compared to urban areas.

In this study, food purchasing expenditures were not significantly related to anemia occurrence in adolescents, likely because family food preferences are not a significant factor for adolescents[19]. Another factor that could influence the relationship between anemia and both variables was uneven distribution of iron-rich food among the families.

CONCLUSION

According to a survey of adolescents living in rural and urban areas of Sumatera Province in Indonesia, the highest household expenditure was for purchasing of fresh fish, whereas the lowest was for meat, poultry, legumes and nuts, preserved meat and milk. Families living in urban areas had higher food expenditures for purchasing of meat, vegetables, fruits, poultry, eggs and milk than did rural families, whereas expenditures for purchasing of fresh and dried fish were higher for rural families. The prevalence of anemia was significantly higher in rural adolescents compared to urban adolescents. However, there was no significant association between expenditure levels for iron-rich foods and anemia. The results of this study indicate the importance of education about iron-rich foods and encourage exploration of alternative sources of protein, to meet the needs for iron-rich foods for rural families.

ACKNOWLEDGMENTS

The authors would like to thank RAND Corporation for authorizing the authors to conduct research using Indonesian Family Life Survey (IFLS) Data 2007.

REFERENCES

1. WHO., 2008. Worldwide Prevalence of Anaemia 1993-2005: WHO Global Database on Anaemia. World Health Organization, Rome, Italy, ISBN-13: 9789241596657, Pages: 48.
2. Riskesdas, 2013. Riset Kesehatan Dasar Tahun 2013. Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI., Jakarta.
3. Masthalina, H., Y. Laraeni and Y. Dahlia, 2015. Pola konsumsi (Faktor inhibitor dan enhancer fe) terhadap status anemia remaja perempuan. J. Kesehatan Masyarakat, 11: 80-86.
4. Zuffo, C.R.K., M.M. Osorio, C.A. Taconeli, S.T. Schmidt, B.H.C. da Silva and C.C.B. Almeida, 2016. Prevalence and risk factors of anaemia in children. J. Pediatr., 92: 353-360.
5. Brown, J.E., J. Isaacs, B. Krinke, E. Lechtenberg and M. Murtaugh, 2011. Nutrition Through the Life Cycle. 4th Edn., Cengage Learning, Belmont, ISBN-13: 978-0538733410.
6. Kandeepan, K., S. Balakumar and V. Arasaratnam, 2016. Nutritional status and food insecurity among the children in Northern Sri Lanka. Procedia Food Sci., 6: 220-224.
7. Humphries, D.L., K.A. Dearden, B.T. Crookston, T. Woldehanna, M.E. Penny and J.R. Behrman, 2017. Household food group expenditure patterns are associated with child anthropometry at ages 5, 8 and 12 years in Ethiopia, India, Peru and Vietnam. Econ. Hum. Biol., 26: 30-41.
8. WHO., 2008. Training Course on Child Growth Assessment. World Health Organization, Geneva.
9. Rand Labor and Population, 2008. Indonesian Family Life Survey (IFLS-4) survey description. https://www.rand.org/labor/FLS/IFLS/ifls4.html
10. Kemenkes Republik Indonesia, 2011. Standar antropometri penilaian status gizi anak. Keputusan Menteri Kesehatan Republik Indonesia, Jakarta.
11. Bagni, U.V., R.R. Luiz and G.V. da Veiga, 2013. Overweight is associated with low hemoglobin levels in adolescent girls. Obesity Res. Clin. Pract., 7: e218-e229.
12. Dhokar, A. and S. Ray, 2016. Prevalence of anaemia among urban and rural adolescents. Int. J. Applied Res., 2: 965-967.
13. Shedole, D.T., G.S. Vidya, H.A. Suryakantha and B. Vijayakumar, 2017. A comparative study on prevalence of anaemia among urban and rural adolescent high school girls of Davangere, Karnataka. Int. J. Commun. Med. Public Health, 4: 4638-4643.
14. Betru, S. and H. Kawashima, 2009. Pattern and determinants of meat consumption in urban and rural Ethiopia. Livest. Res. R. Dev., Vol. 21, No. 9.

15. Balci, Y.I., A. Karabulut, D. Gurses and I.E. Covut, 2012. Prevalence and risk factors of anemia among adolescents in Denizli, Turkey. Iran. J. Pediatr., 22: 77-81.
16. Badan Pusat Statistik, 2007. Expenditure for Consumption of Indonesia 2007. BPS Statistics Indonesia, Jakarta.
17. Badan Pusat Statistik, 2017. Consumption Expenditure of Population of Indonesia. BPS Statistics Indonesia, Jakarta.
18. Babalola, D.A. and S.U. Isitor, 2014. Analysis of the determinants of food expenditure patterns among urban households in Nigeria: Evidence from Lagos State. IOSR J. Agric. Vet. Sci., 7: 71-75.
19. Ahmed, F., A. Rahman, A.N. Noor, M. Akhtaruzzaman and R. Hughes, 2006. Anaemia and vitamin A status among adolescent schoolboys in Dhaka city, Bangladesh. Public Health Nutr., 9: 345-350.