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Prevalence of anaemia and its associated factors among school adolescent girls in Baglung municipality, Nepal

Shraddha Hamal *[1], *Govinda Prasad Dhungana* [2], *Prabin Shrestha* [3,4], *Niraj KC* [1]

ABSTRACT

Introduction

Anaemia due to iron deficiency is widespread major public health problem especially in developing countries like Nepal. Among adolescent girls, it brings negative consequences on growth, school performance, morbidity and reproductive performances. The aim of the study was to find out the prevalence of anemia and its associated factors among school adolescent girls in Baglung Municipality.

Methods

Descriptive cross-sectional study was conducted among 10 to 19 years of girls from all the higher secondary schools in Baglung Municpality. Sample size was calculated by using finite population correction formula. Simple random sampling was applied to draw 316 samples from 1649 adolescent girls of 13 higher secondary schools. One ml of venous blood was drawn by vein puncture under aseptic condition by Laboratory Technician and collected in EDTA only after taking written consent of the parents and it was analyzed in the pathology within one hour of collection to determine the hemoglobin concentration. Face to face interview technique was used to collect data by using semi-structured questionnaire schedule.

Result

The study found 42.5% (95% CI: 36.84% - 48.16%) prevalence of anemia among adolescent girls in Baglung municipality. The prevalence of anemia was found to be significant with education status of father (p=0.001), Consumption of deworming tablets (p=0.020), Consumption of green leafy vegetables (p=0.005) and prolonged menstrual bleeding (> 7 days) (p=0.002).

Conclusion

Overall this study found 42.5% prevalence of anemia among school adolescent girls. Adolescent period is more vulnerable especially among girls due to rapid growth, dietary insufficiency, menarche, excessive menstrual bleeding and other acute infection like worm infestation which may demand higher iron supplementation to maintain the iron level in the body. Thus, there is an urgent need to address this problem in adolescent period to prevent maternal and child mortality and morbidity in the near future.

Keywords: Anemia, Adolescent Girls, Hemoglobin, Prevalence, Baglung

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[1]**Graduate Student (Public Health), Chitwan Medical College, Bharatpur, Chitwan**

[2]**Lecturer, Birendra Multiple Campus, Tribhuvan University**

[3]**Department of Psychology and Philosophy, Trichandra Multiple Campus, Ghantaghar, Kathmandu**

[4]**Lecturer, Department of Psychology and Social Work, British Gurkha College, Bansbari, Kathmandu**

***Corresponding Author**
Shraddha Hamal
Graduate Student, Public Health
Chitwan Medical College, Bharatpur, Chitwan
dipshayu@gmail.com
Phone number: +977-9847633288

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INTRODUCTION

Adolescence defined by WHO as a period of life spanning the ages between 10 to 19 years.[1] This is a vulnerable period in the human lifecycle for the development of nutritional anemia, which has been constantly neglected by public health programs.[2] Anemia is a condition in which the number of red blood cells is insufficient to meet the body's physiologic needs.[3] Adolescents particularly girls are affected by iron deficiency Anemia especially in developing countries due to low intake and absorption of iron and the increased iron requirement for growth and replacement of menstrual blood losses.[4] The WHO Global Database on Anemia (1993-2005), estimated the prevalence of Anemia worldwide was 25%.[5] The prevalence of anemia in adolescent girls reported by different studies showed Thailand 17%, Indonesia 30%, Srilanka 40%, Bangladesh 40%, Myanmar 45.2%, Nepal 46%, Maldives 50% and India 90%.[6] A report from semi-urban Nepal in 2000 showed that prevalence of anemia in adolescent girls was 68.8%.[7] A study conducted by Baral K, et.al 2009 showed 78.3% prevalence among adolescent girls in Morang district.[8] Nepal Demographic Health Survey, 2011 showed the national prevalence of anemia among adolescent girls was 38.5% and it was 34.5% in the Western Development Region.[9] A study conducted among adolescent girls in Kathmandu valley found the prevalence of anemia to be 35.3%.[10] Studies investigating the prevalence of adolescent anemia in Nepal are limited. The aim of the study was to identify the prevalence of anemia among adolescent girls in Baglung municipality, a city in the Western region of Nepal.

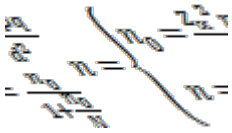
MATERIAL AND METHODS

Study Design, Site and Population

A descriptive cross-sectional design was conducted in Baglung district, a hilly district, situated in western development region of Nepal. Study population was 10-19 years girl from the higher secondary schools in Baglung Municipality. Altogether there were 5 public schools and 8 private schools with a sampling frame of total population of 1649 adolescent girls.

Sample Size and Sampling

The sample size was calculated using the finite population correction formula[11].

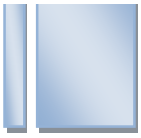


Where, "p" was taken as 0.345 (34.5% prevalence of anemia among adolescent girl of western development region as per the report of NDHS 2011. Level of significance (α) and absolute allowable error was taken at 5% whereas study population (N) for the study was 1649. The sample size was calculated as 287 and adjusted to compensate for non-response rate of 10% (10 % of 287=29). Hence, final sample size was 316. Out of total sample 316, 22(6.96%) respondents were excluded from the study during the collection of data because they refused to give blood sample to determine hemoglobin concentration. Hence, final study was done among 294 samples.

Pretesting of Field Work

Tools were pretested in Biddhya Mandhir Higher Secondary School and Dignity Higher Secondary School among 10% samples and necessary changes were made in the tool prior to final data collection. The respondents were kept away from negative effects of penetration and made comfortable as much as possible.

In addition, blood sample was drawn by a Lab technician in the school, in a separate room by applying the standard precaution. The blood was stored in the EDTA test tube immediately. To ensure the reliability of the lab results, hemoglobin test of 10% respondents of the blood sample from Biddhya Mandhir Higher Secondary School and Dignity Higher Secondary School was cross-checked in the two different labs during pretesting. The selected lab was laboratory department of Dhaulagiri zonal hospital and another was a licensed lab of Pathology Centre of Adalat Road -2, Baglung. The reliability coefficient of two laboratory values majored by Pearson correlation ($r=0.645$; $p<0.001$).



Data Collection

Data collection was done by face to face interview method; using a semi-structured schedule among the study participants. In addition, one ml of venous blood was drawn by vein puncture (median cubital vein) under aseptic precautions after written consent taken from parents of the children. Blood was collected in EDTA (ethylenediaminetetraacetic acid). The collected samples were transported to laboratory department of Dhaulagiri Zonal Hospital within one hour of collection and was analyzed with the help of Senior Lab Technician by cyanmethemoglobin method to get the results of hemoglobin concentration. Also, re-testing of 10% blood sample was cross-checked in two labs from the total sample blood, and it was observed significantly positive relation ($r=0.740$; $p<0.001$). Consistency and accuracy of collected data were checked. Internationally recommended (gold standard) cyanmethaemoglobin method was used to determine the hemoglobin concentration of the blood sample.[12]

Data Analysis

The collected data was edited manually to check completeness and accuracy and entered in Epi data 3.1. Data analysis was done in IBM SPSS 19 version. Descriptive analysis of socio demographic, personal hygiene, health-related and food habit related variables were described in percentage and presented in table. In the bivariate analysis, Chi-Square test was applied to test the significance of the association between independent and dependent variables ($p<0.05$). The odds ratio was used to estimate the magnitude of the association between variable (95% C.I). In multivariate analysis, Binary Logistic Regression Model was used to show the association between the dependent and independent variables. The goodness of fit of the model was assessed by using Hosmer DW Lemeshow. Only those independent variables found significant at (<0.05) in the bi-variate analysis were subjected for multi-variate analysis.

RESULTS

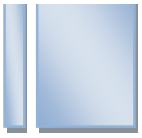
Sociodemographic Characteristics

Majority of respondent were middle adolescent (40.1%) followed by the early adolescent (39.5%) and late adolescent (20.4%). Similarly, more than two-third (69.0%) of the respondent were from secondary level followed by higher secondary school (21.8%) and primary school (9.2%). Likewise, 60.5% respondents were in private school and 39.5% in public school. Based on place of residence, the majority of the respondents were from urban resident (68.7%) followed by rural (31.3%). The educational status of respondent's father had 39.5% secondary level education followed by higher secondary or above (28.2%). Similarly, respondent' mother education status had secondary 30.3% followed by lower secondary (21.4%). Regarding, Body Mass Index (BMI), half (49.3%) of respondent were underweight and (8.8%) were overweight. About more than two-third (67.0%) of the respondent had already attained menarche at the time of data collection. On the basis of duration of menstrual blood flow among those attaining menarche, majority complained ≤7 days menstrual bleeding (66.5%) followed by >7 days menstrual bleeding (33.5%).

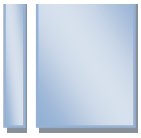
More than half (52.0%) respondents took any deworming tablet in the last 6 month whereas 47.3% consumed green leafy vegetables sometimes. Similarly, approximately half (49.7%) consumed red met as a sometime followed by occasionally (22.1%) and never consumed (28.2%).

Table 1 Sociodemographic Characteristics

Characteristics	Number	Percent
Age		
Early Adolescent	116	39.5
Middle adolescent	118	40.1
Late Adolescent	60	20.4
Class		
Primary	27	9.2



Secondary	203	69.0
Higher Secondary	64	21.8
Type of School		
Private	178	60.5
Public	116	39.5
Place of Residence		
Urban	202	68.7
Rural	92	31.3
Father's Education		
Illiterate	23	7.8
Non-Formal education	23	7.8
Primary	26	8.8
Lower secondary	23	7.8
Secondary	116	39.5
Higher secondary or above	83	28.2
Mother's Education		
Illiterate	25	8.5
Non-Formal education	44	15.0
Primary	34	11.6
Lower secondary	63	21.4
Secondary	89	30.3
Higher secondary or above	39	13.3
BMI		
Underweight	145	49.3
Normal	123	41.8
Overweight	26	8.8
Attained menarche(n=294)		
Yes	197	67.0
No	97	33.0
Duration of menstrual bleeding(n=197)		
≤7days menstrual bleeding	123	66.5
>7 days menstrual bleeding	74	33.5
Deworming has taken in last 6 month(n=294)		
Yes	153	52.0
No	141	48.0
Consumption of green leafy vegetables(n=294)		
Daily	88	29.9
Sometimes	139	47.3
Occasionally	16	5.4
Never	51	17.3
Consumption of red meat(n=181)		
Sometimes	90	49.7
Occasionally	41	22.1
Never	50	28.2



Prevalence of Anemia

Anemia was classified into mild anemia, moderate anemia, and severe anemia according to WHO criteria. Findings of the present study demonstrated that the overall prevalence of anemia was 42.5% (95%CI:36.84%-48.16%) with that of mild anemia 38.1%, moderate anemia 4.4% and no severe anemia found among anemia cases. More than half (57.5%) respondent had normal hemoglobin level.

Table 2 Prevalence of Anemia

Characteristics	Number(n=294)	Percent
Mild anemia (10-11.9 gm/dl)	112	38.1
Moderate anemia (7 -10 gm/dl)	13	4.4
Total	**125**	**42.5**
No anemia (≥12gm/dl)	169	57.5

Predictors of Anemia

To explorer the predictors, those variables that demonstrated significant association at 95% level ($p<0.05$) in the bivariate analysis were only included in the multivariate analysis. Multivariate analysis was performed to know the net effect of the independent variables on anemia in adolescent girls to find out the strong predictor of anemia.

Multivariate analysis found the strongest predictor of anemia which was education status of father. The respondents whose fathers were illiterate were found 35.705 (OR=35.705, CI: 6.205-205.452) times more likely to be anemic whereas, non-formal education 6.615 (OR=6.615, CI: 1.175-37.249) times and secondary level education 9.151(OR=9.151, CI: 2.098-39.924) times likely to be anemic than respondents from those fathers who had studied higher secondary or above. Similarly, duration of menstrual bleeding was another predictor for anemia in an adolescent girl. As the respondent who complained bleeding for more than 7 days during menstruation were 6.167 (OR=6.167, CI=1.924-19.771) times more likely to be anemic. Similarly, the respondents who had not taken deworming in last 6 month were 3.032(OR=3.032, CI=1.187-7.746 times more likely to be anemic than that respondent who had taken deworming tablets. Likewise, the respondent who had not to consume green leafy vegetables were 12.939 (OR=12.939, CI=2.209-75.770) times more likely to be anemic than those consumed green leafy vegetables.

Table 3: Predictors of Anemia

Predictors	Unadjusted OR	Adjusted OR	95% CI		P value
			Lower	Upper	
Religion-Hindu*					
Others than Hindu	2.80	1.23	0.30	5.03	0.774
Father's Education- higher secondary or above*					
Illiterate**	**31.17**	**35.71**	**6.21**	**205.45**	**0.001**
Non- formal	**10.08**	**6.62**	**1.18**	**37.25**	**0.032**
Primary	4.31	4.13	0.61	27.92	0.146
Lower sec.	2.93	1.04	0.12	9.40	0.973
Secondary	**5.12**	**9.15**	**2.10**	**39.92**	**0.003**
Hand washing after toilet- soap, and water*					
Other than soap and water*	**4.30**	**11.26**	**1.98**	**64.19**	**0.006**
Hand washing before food- others plus water*					
Water only	1.72	0.91	0.36	2.30	0.848
Years of menstruation- Early*					

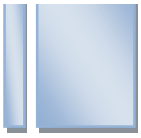
Middle adolescent	0.38	0.53	0.18	1.60	0.262
Late adolescent	1.08	0.47	0.06	3.49	0.459
Menstrual bleeding- ≤7 days*					
>7days bleeding**	**3.74**	**6.17**	**1.92**	**19.77**	**0.002**
No of pads used/day- ≤3 pads/day*					
>3 pads/day	2.01	0.37	0.13	1.09	0.70
Deworming –Yes*					
No**	**2.79**	**3.03**	**1.19**	**7.75**	**0.020**
Food pattern- non-vegetarian*					
Vegetarian	2.42	0.86	0.31	2.33	0.762
Consumption of green vegetables, yes*					
No	**12.57**	**12.94**	**2.21**	**75.77**	**0.005**
Fast food has taken- occasionally*					
Sometimes	1.01	3.84	0.50	29.58	0.196
Daily	5.82	2.44	0.51	11.80	0.267

**Reference categories, **Significant level at 0.001, Nagelkerke R^2=0.577,-2LLiklihood=133.009; Hosmer and Lemeshow goodness of fit =0.248*

DISCUSSION

Findings of the present study demonstrated that the overall prevalence of anemia was 42.5% (95% CI:36.84%-48.16%) with that of mild anemia 38.1%, and moderate anemia 4.4%, which is higher than NDHS 2011 findings which found 34.5% anemia among adolescent girls in western development region.[9] It is around 8% lower than current prevalence of study findings. A community-based study in rural and urban areas of Morang district by Baral K et.al in 2009 found 78.3% prevalence of anemia among adolescent females.[8] A study conducted by Gupta R et.al in 2013 of central Kathmandu valley showed 35.3% prevalence among adolescent girls which was lower than the current one.[10] The anemia prevalence found in the current study was consistent with the study conducted in Karnataka, South India by Siddharam SM et.al, 2011 which showed a 45.2% prevalence among adolescent girls.[13] Although both findings showed higher prevalence, these findings showed more diversification with present findings of the study and it could be due to the difference in the study area. While this study is concordance with a study conducted on the prevalence of anemia amongst adolescent female by Dubey R et.al 2013 in western Nepal which found 42% overall prevalence of anemia among adolescent girls with various grades of anemic condition 59.14% mildly anemic, 32.02% moderately anemic and 8.82% severe anemic and also found higher prevalence of anemia at the age of 17 years and age category showed the significant association with grades of anemia ($p<0.05$).[14] Similarly, another study conducted in Far western part of Nepal, Singh P et.al, 2013 had documented 29.7% anemia in adolescent females where the highest prevalence of anemia occurred in the 18 to 19 years age.[15]

In present study, binary logistic model was used to assess the effect of significant explanatory variables to the outcome variables i.e. anemia which found significant association with religion, education status of father, hand washing technique after toilet, hand washing technique before food, menarche attained, age of first menstruation, duration of bleeding during menstruation, number of pads use per day during menstruation, deworming tablets taken in last 6 month, food pattern, consumption of green vegetables, consumption of red meat, and number of fast food consumption. A multivariate logistic regression model was used to distinguish predictors of Iron deficiency anemia which gave rise to following strong predictors. Education status of father, illiterate (OR=35.705, CI=6.205-205.452), non-formal education (OR=6.615, CI=1.175-37.249), secondary level education (OR=9.151, CI=2.098-39.924) as compared to higher secondary or above. Hand washing methods after toilet like hand washing done other than soap and water (OR=11.264,CI=1.977-64.189) as compared to hand washing with soap and water, menstrual bleeding as >7days bleeding



(OR=6.167,CI=1.924-19.771) as compared to ≤7 days bleeding, deworming pattern that include those who did not take antihelminthic tablets in last 6 month (OR=3.032,CI=1.187-7.746),consumption of green vegetables with those who did not consume green vegetables (OR=12.939,CI=2.209-75.770). The current study had shown similar opinion regarding menstrual bleeding and anemia as it had shown in a study conducted in Wardha[17] but in case of vegetarian diet it was not a significant predictor. In case of worm infestation around equal prevalence was found among respondents who complained worm infestation 42.4% and who did not complain worm infestation 42.5% but they were not statistically significant (OR=0.996, CI=0.479-2.072). This study also has shown the contrary result with that of Singh R result as it found no association by father's occupation, mother's education status and socio-economic status.

A study conducted in Western Uganda in 2013, revealed that overall prevalence among female school adolescent was 46% which is consistent prevalence somehow as observed in the present study. Prevalence was twice as high in urban school 61% as compared to rural school 31%. Anemia was positively correlated with inadequate dietary intake (r=0.61, p=0.001) and improper deworming (r=0.51, p=0.04),[16] which corresponded to the present study as food habit related variables like food pattern, consumption of green vegetables, consumption of red meat, number of fast food taken and deworming status were found significantly associated with hemoglobin level of respondents in Bi-variate analysis. And while doing multivariate analysis strong contributing factors of anemia were consumption of green vegetables (OR=12.939, CI=2.209-75.770) and deworming (OR=3.032, CI=1.187-7.746). Similarly, a study conducted on Prevalence and risk factors of Anemia among adolescent girls residing in a rural community of Puducherry by Ramacharan R et.al, 2013 found higher prevalence 73.5% with that of mild, moderate and severe anemia 77.3%, 20.2% and 2.5% respectively.[18] Binary logistic regression found mother's occupation (working mothers, OR=2.89, CI=1.13-7.44) than unemployed mothers, washing hands before and after toilet were (OR=0.49, CI=0.24-0.99) than no hand washing before and after toilet , respondents having normal BMI (OR=0.49, CI=0.24-0.99) than underweight and also menstrual flow days (≤5 days were OR=0.51, CI=0.24-1.09) than > 5 days menstrual flows were found significant in Bi-variate analysis while others factors were found insignificant.[18]

CONCLUSION

Anemia is a major public health problem in developing countries like Nepal. High prevalence of mild and moderate anemia demands urgent intervention to bring down the prevalence of anemia in adolescent girls. If the iron level in the body is maintained in optimum level from the very beginning in girls then it may uplift the pregnancy and delivery outcome reducing maternal and infant mortality.

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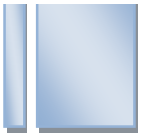

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