PREVALENCE OF ANEMIA AND ITS ASSOCIATED FACTORS AMONG ADOLESCENT GIRLS ON WEEKLY IRON FOLIC ACID SUPPLEMENTATION (WIFAS) IMPLEMENTED AND NON-IMPLEMENTED SCHOOLS AT TOKHA MUNICIPALITY, KATHMANDU

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Central Department of Public health

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Tribhuvan University

Kathmandu, Nepal

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THESIS APPROVAL SHEET

This is to certify that Ms. Anita Khanal has prepared the thesis entitled *"Prevalence of anemia and its associated factors among adolescent girls on weekly iron folic acid supplementation (WIFAS) implemented and non-implemented schools at Tokha municipality, Kathmandu"* under our supervision and guidance. This thesis is prepared for the partial fulfillment of the requirement for the degree of Masters in Public Health Nutrition (MPHN). The thesis has been accepted and recommended for final examination.

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This thesis report has been approved ☑ not approved ☐

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DECLARATION

To the best of my knowledge and belief, I declare that this research thesis entitled *"Prevalence of anemia and its associated factors among adolescent girls on weekly iron folic acid supplementation (WIFAS) implemented and non-implemented schools at Tokha municipality, Kathmandu"* is the product of my own work and contains no material previously submitted by any other person except where due acknowledgment has been made. This thesis contains no material, which has been accepted for the award of any other degree or diploma in any university.

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I, Asst. Prof. Rajan Paudel, being the Supervisor of Anita Khanal who is a MPHN student in the Central Department of Public Health, Institute of Medicine, certify that I have sighted the documentation supporting the thesis entitled "*Prevalence of anemia and its associated factors among adolescent girls on weekly iron folic acid supplementation (WIFAS) implemented and non-implemented schools at Tokha municipality, Kathmandu*" and I am satisfied that the documentation is sufficient as the basis for examination.

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ABSTRACT

Introduction: One of the WHO's eight primary effective actions for enhancing adolescent nutrition that is outlined in the 2018 recommendations is WIFAS (weekly iron and folic acid supplementation). There is a window of opportunity for kids to improve their nutritional status during the adolescent years. Nutritional deficiencies can have long-term effects, but if we act appropriately now, we can prevent them. In Nepal, very few studies on adolescent anemia have been conducted. Weekly iron folic acid supplementation is relatively a new program and it could be the most cost-effective intervention to break the intergenerational cycle of anemia. Several studies have shown a statistically significant link between taking folic acid and iron supplements and preventing anemia

Methods: The general objective of the study was to assess the difference in the prevalence of anemia and its associated factors among adolescent girls on Weekly Iron Folic Acid Supplementation (WIFAS) implemented and non-implemented schools at Tokha Municipality, Kathmandu. A cross-sectional study was carried out among 602 adolescent girls from classes 6-10 equally divided into two groups from government schools (WIFAS implemented) and private schools (WIFAS not implemented). The (PPS) method was used to determine the number of class cluster and the students from each cluster was included. Hemoglobin estimation was done using the HemoCue method to determine the hemoglobin estimation. The validated tool was used to collect the data. The univariate, bivariate and multivariate analysis was done using SPSS version 25 to identify significant association between dependent and independent variables.

Results: The overall prevalence of anemia was found to be 17.4 %. Among the total sample, 14%(42) and 20.9 % (63) of adolescent girls from government and private schools were anemic respectively whereas 86% (259) and 79.1% (238) were non anemic respectively. Bivariate analysis of the variables revealed that age, mother's education, fathers'education, mothers'occupations, compliance, knowledge on anemia, knowledge on WIFAS, class and dietary diversity were found to be significantly associated with anemia. The factors like fathers' education, knowledge on WIFAS and

dietary diversity were only found to be associated with anemia during multivariate regression analysis. Similarly, the factors like class, type of family and provision of school health nurse were found to be associated with compliance in WIFAS implemented schools during multivariate regression analysis. According to the WHO classification on prevalence of anemia, the study site ranks as having mild public health problems of anemia among school going adolescent girls in Tokha municipality.

Conclusion: In the study, the prevalence of anemia among the WIFAS implemented school was lower as compared to the not implemented school. The present study revealed that the supervision by the school teacher or supervisor increases the compliance to WIFAS which ultimately help to lower the prevalence of anemia among adolescent girls. In the study, the factors like fathers' education, knowledge on WIFAS, and dietary diversity were found to be associated with anemia. Promotion of proper utilization of Weekly Iron and Folic Acid Supplementation (WIFS) program is recommended. The development of a peer-led strategy, or a girl-to-girl approach, is required in order to inform and counsel adolescent girls about the program advantages in order to increase the compliance and decrease the prevalence of anemia among adolescent girls.

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Anita Khanal

MPHN 2nd year

2023

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LIST OF ABBREVIATIONS

DALY	:	Disability Adjusted Life Years
DoHS	:	Department of Health Services
Hb	:	Hemoglobin
IFA	:	Iron Folic Acid
LBW	:	Low Birth Weight
MEML	:	Model Essential Medicines List
NDHS	:	Nepal Demographic and Health Survey
NTD	:	Neural Tube Defects
SDG	:	Sustainable Development Goals
SHN	:	School Health Nutrition
SPSS	:	Statistical Package for Social Sciences
WIFAS	:	Weekly Iron Folic Acid Supplementation
WRA	:	Women of Reproductive Age group

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CHAPTER I: INTRODUCTION

1.1 Background

The most common nutritional disorder in the world is anemia which affects people living in developing countries the most and is more prevalent in adolescents[1-3]. According to the World Health Organization, anemia is a condition that reduces the blood's capacity to transport oxygen throughout the body by lowering hemoglobin concentration or red blood cell size[4]. Adolescence, according to the World Health Organization (WHO), is the stage of life between childhood and adulthood, from the ages of ten to nineteen, during which people experience rapid physical, cognitive, and emotional growth and set the foundation for excellent health[5].

On female adolescents, anemia has three main effects: Poor academic performance (and attentional problems), productivity loss (e.g., helping younger siblings, agricultural work, wage labor, or volunteer activities), and decreased present and future reproductive health for those who conceive[6,7]. The Global Strategy for Women's, Children's, and Adolescents Health (2016–2030) includes adolescents for the first time as a priority group for achieving the Sustainable Development Goals[8].

Investing in adolescent health has a triple return on investment for teenagers, adults, and their offspring. Loss of DALYs in adolescents is primarily due to iron deficiency anemia[9,10]. The SHN Program in Nepal started weekly Iron Folic Acid (IFA) supplementation for adolescent females aged 10 to 19 years for preventing and controlling the high burden of Iron Deficiency anemia among this demographic. Since 2015, the Shrawan (Shrawan-Asoj) and Magh (Magh-Chaitra) two rounds in Nepal have included a phased supplementation program for all adolescent girls between the ages of 10 and 19 that includes 400 mcg of folic acid and 60 mg of iron. Each round lasts 13 weeks, and they receive an IFA tablet once a week. Each teenage girl gets 26 IFA tablets total per year[11].

Intermittent iron and folic acid supplementation is advised for menstruating women living in anemic areas to improve hemoglobin concentration and iron status and reduce the risk of anemia in populations where the prevalence of anemia among non-pregnant women of reproductive age is 20% or higher[9,12,13].

1.2 Statement of problem

In 2019, there were 29.9% of women worldwide who were anemic, with the highest prevalence still being found in South-East Asia, where it is over 35%[14]. Although there is a dearth of information on adolescents worldwide, 30% of teenagers are thought to be anemic[15]. The prevalence of anemia among WRA has been steadily rising from 35% in 2011 to 41% in 2016, and among adolescents 15–19, from 39% in 2011 to 44% in 2016. This is despite historical efforts to prevent anemia through the implementation of national nutrition programs and policies, including iron-folic acid supplementation nationwide[16]. These figures suggest that anemia continues to be a serious public health problem in Nepal.

Every stage of life is impacted by iron deficiency in adolescent girls. Pregnancy is too short period for women to accumulate sufficient iron reserves to meet the needs of the growing fetus, and anemic women have lower pre-pregnancy iron stores. Adolescent girls who are anemic are more likely to deliver prematurely and have infants with low birth weight[17].

After three months of supplementation, the "Daily Iron Folic Acid Supplementation" group saw a reduction in the prevalence of anemia of 25%, while the "Weekly Iron Folic Acid Supplementation" group saw a reduction of 31.67%.[18]. The compliance to weekly iron-folic acid supplementation was found to be 45.6% and about half of the adolescents did not think that it is necessary. The school readiness was found important factor to increase compliance to supplementation[19].

Anemia was prevalent among schoolchildren in 51% of WIFAS implemented schools (with WIFAS) and 64.4% of not implemented schools (not on WIFAS). The mean hemoglobin levels in WIFAS implemented and not implemented school females were 11.77 and 11.34, respectively, which was statistically significant[20]. Similarly, in a study conducted in Puducherry, India, 2021, it was found the prevalence of anemia to be 62.7% and adolescents compliant to WIFS was 67.7%[21].

Before intervention, the prevalence of anemia in adolescent girls was 79.5%; as a result of supplementation with weekly iron-folic acid tablets administered under close supervision and nutrition education provided by peer educators at the community level, this number was reduced to 58%[22]. By the end of the one-year intervention of weekly

iron folic acid supplementation, anemia, which was present in 38% of the adolescent population at the beginning of the study, had decreased to 26%[23].

Therefore, without the weekly iron folic acid supplementation, the decrease in the prevalence of anemia would not be such possible. Hence prevalence of anemia is a public health issue.

1.3 Rationale for the study

The national nutrition program is one of the priority one (P1) program of the Ministry of Health where supplementation of WIFAS is one of the major nutrition specific programs implemented since 2015. Before teenagers become parents, taking iron and folic acid supplements can help to promote health[24].

SDG Goal 3: "To ensure healthy lives and promote well-being for all at all ages.", could be achieved by improving the nutritional status of adolescents, as different studies have revealed that folic acid supplements during the adolescent period serve as iron storage which could be better utilized during pregnancy to prevent LBW babies in future. Weekly iron-folic acid supplementation is a better investment in the pre-pregnancy period [13, 17, 25].

Weekly iron-folic acid supplementation (WIFAS) has been suggested as a long-term preventive strategy to enhance iron status and also to lower the prevalence of anemia in later adolescent life[23]. IFA supplementation on adolescents' hemoglobin concentration has been shown to have positive effects in recent studies from Ghana, India, and Nepal[18, 24,26].

According to studies, consuming IFA is positively correlated with higher hemoglobin levels and negatively correlated with lower anemia levels, and taking iron and folic acid tablets can help prevent anemia[26]. Weekly iron and folic acid supplementation programs offered in schools may therefore be a helpful intervention for enhancing adolescent compliance, lowering anemia prevalence, and boosting program effectiveness.

1.4 Research Questions

1. What is the prevalence of anemia among adolescent girls of WIFAS implemented government schools and WIFAS non-implemented private schools in Tokha municipality?
2. What is the association between compliance, sociodemographic variables with prevalence of anemia?
3. What is the compliance, its associated factors and knowledge on weekly iron folic acid supplementation among adolescent girls on WIFAS implemented schools of Tokha municipality?

1.5 Research Objectives

General objectives

To compare the prevalence of anemia and its associated factors among school implementing and not implementing weekly iron and folic acid supplementation among adolescent school girls in Tokha municipality.

Specific objectives

1. To assess anemia among school implementing and not implementing WIFAS among adolescent girls.
2. To identify the association between anemia and socio-demographic factors.
3. To identify the association between anemia and compliance among adolescent girls on WIFAS implementing school.
4. To determine the compliance and its associated factors among adolescent girls on WIFAS implemented schools.
5. To assess the knowledge on anemia, weekly iron folic acid supplementation and dietary diversity among schools implementing and not implementing weekly iron and folic acid supplementation.

1.6 List of Variables

A. Outcome variable : Anemia**.**

B. Explanatory variables :

I. **Socio- demographic variables:** Age, Age at menarche**,** Marital status**,** Ethnicity**,** Religion**,** type of family, Father Education**,** Mother education**,** Father occupation**,** Mother occupation

II. **Knowledge-related variables:** Knowledge on anemia, knowledge on WIFAS

III. **Compliance to WIFAS**
Number of tablet feed

IV. **Dietary Diversity**

C. Hemoglobin level

1.7 Operational Definitions

Anemia

WHO defines anemia in adolescents girls with hemoglobin level ≥12 as nonanemic and haemoglobin level <12g/dl as anemic. Further anemia for non-pregnant women is classified as mild anemia (11 to 11.9 gm/dl), moderate anemia (8 to 10.9gm/dl) and severe anemia (< 8gm/dl)[12].

Prevalence of anemia

Anemia prevalence according to the WHO is 4.9% no public health problem, 5%–19.9% mild public health problem, and 20%–39.9% moderate and > 40% severe public health issues[12].

Weekly iron folic acid supplementation[10]

Supplement composition	Iron: 60 mg of elemental iron Folic acid: 400 µg
Number	One supplement per week
Duration and time interval between periods of supplementation	3 months of supplementation (13 weeks) followed by 3 months (13 weeks) of no supplementation after which the provision of supplements should restart(13 weeks).
Target group	All adolescent girls (10-19)
Total duration of supplementation	26 weeks per year

Ethnicity: Ethnicity was identified as defined by NDHS 2022 Dalit, Janjati, Madhesi, Muslim, Brahman/Chhetri and Others[27].

Religion: Religion was classified as defined by NDHS 2022 as Hindu, Buddhist, Muslim, Kirat, Christian and Others[27].

Marital status: Marital status was classified as defined by NDHS 2022 as Never married, Married/living together, Divorced/Separated and Widowed [27].

Educational level: Education was marked as per NDHS 2022; it was categorized as no education, basic education, secondary education and more than secondary education[27]. It was further categorized as below:

Basic education from grade one to eight, lower basic education from grade one to five and upper basic education from grade six to eight.

Secondary education from grade nine to twelve, lower secondary education from grade nine to ten and upper secondary education from grade eleven to twelve.

More than secondary education from grade thirteen and above.

Type of Family: It is the composition of the family. It was further categorized as [28]

Nuclear: Parents and their children living together.

Joint and extended: Living with grandparents and other relatives.

Occupation: Occupation of the parents was referred as: Agriculture, Housework, government Service, private business, Foreign Employment, Daily wages and Others[2]

School going adolescents: The students studying in WIFAS implemented and not implemented schools from grade 6 to 10 were considered as school going adolescents for this study.

Level of knowledge: The level of knowledge of the respondents was calculated by adding up all related questionable items. Each item received a score of "1" for a correct response and "0" for an incorrect response. Those who scored above the median value was classified as having good WIFAS and anemia knowledge, while those who scored below the median value was classified as having poor WIFAS and anemia knowledge [29]. In the present study, the median value for knowledge on anemia was six and the median value for knowledge on WIFAS was five.

Compliance: WIFAS compliance was measured on the basis of the number of tablets fed in the immediate last one month. The number of four tablets consumed in the past 4 weeks was considered compliant to WIFAS. The compliance was classified >75% as high compliance, 50 to 75% as medium compliance and <50% as low compliance[30].

Dietary diversity: It describes the quantity of foods or food groups that were consumed during a specific reference period. Dietary diversity scores in this study were calculated based on FAO guidelines. The participants in the 24-hour recall were asked to describe the food and beverages they had in the previous 24 hours. Starting from food or drink in the morning, during day and night (breakfast, snack, lunch and dinner) whether home or outside.

MDD-W is a dichotomous indicator of whether or not women 15–49 years of age have consumed at least five out of ten defined food groups the previous day or night [31].

The ten food groups are:

1. Grains, white roots and tubers, and plantains
2. Pulses (beans, peas and lentils)
3. Nuts and seeds
4. Dairy
5. Meat, poultry and fish
6. Eggs
7. Dark green leafy vegetables
8. Other vitamin A-rich fruits and vegetables
9. Other vegetables
10. Other fruits

The categories of dietary diversity were measured as follows[31]

Adequate dietary diversity: If consumed ≥ 5 food groups.

Inadequate dietary diversity: - If consumed 4 and less food groups.

1.8 Conceptual framework

INDEPENDENT VARIABLES **OUTCOME VARIABLE**

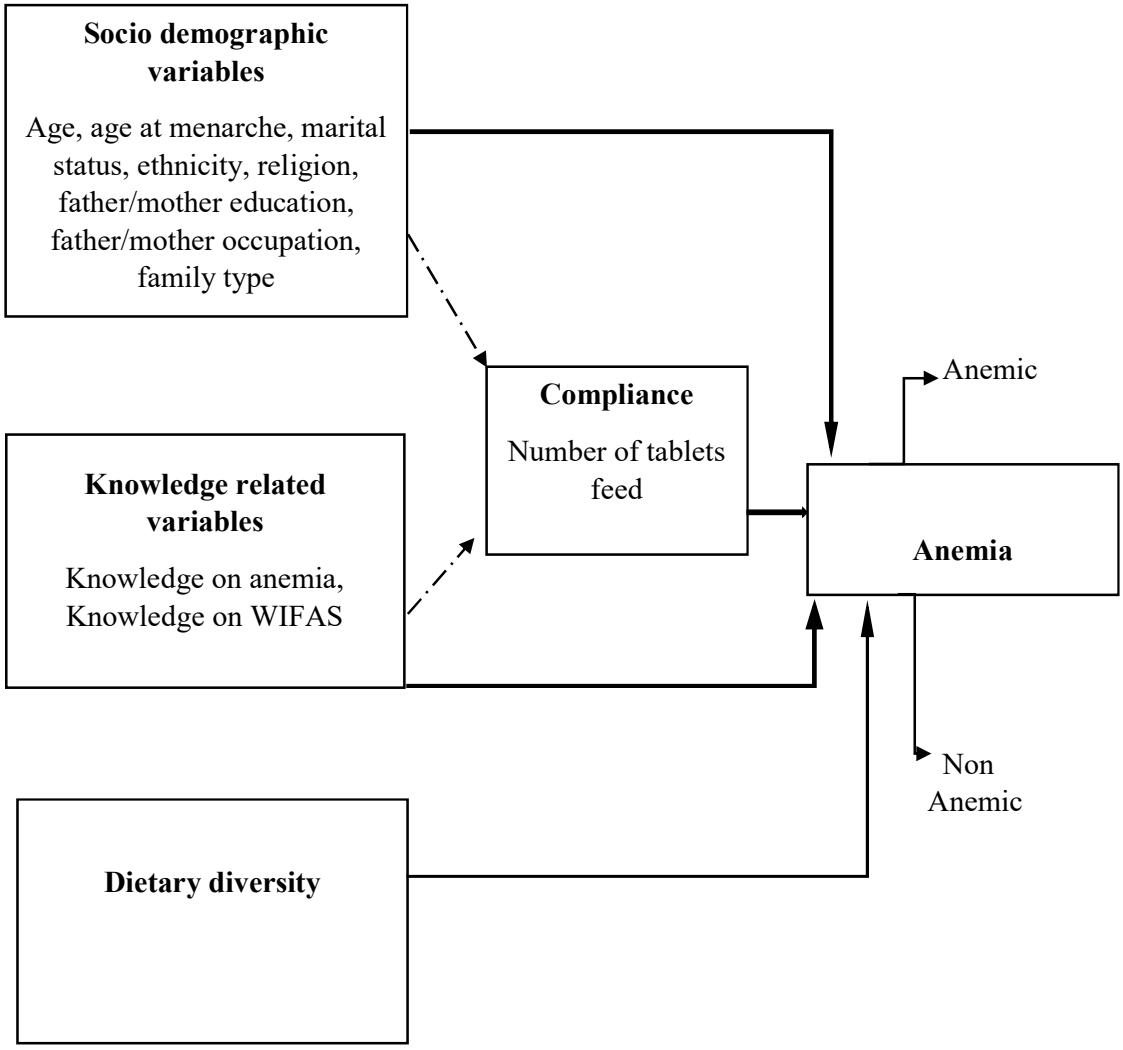

Figure 1: Conceptual framework of the study

CHAPTER II: LITERATURE REVIEW

Several search engines were used to conduct a literature review such as PubMed, The Lancet, Google, Google scholar, research gate, BMJ, and others to find relevant study contents. Various key terms were utilized to search the publications, including anemia, iron deficiency anemia, prevalence of anemia, IFA, adherence and compliance, adolescents, perceived benefits, Knowledge on anemia and WIFAS and dietary diversity. Journal papers, books, survey reports, WHO factsheets, policy and guidelines, and other sorts of articles were discovered. The documents were then gathered into a single folder in the Zotero app. The publications were then thoroughly examined, and relevant data was gathered in order to develop this research thesis. Zotero was used to create the citation in Vancouver style. The reviewed literature is categorized into following parts:

2.1 Policies regarding adolescent health and nutrition

In Nepal, there are a number of policies and programs in place to address adolescent health and nutrition concerns. This article highlights some of the most essential policies and practices. The current National health policy 2019 has two goals on nutrition and health. The goal no. 6.13 emphasized on healthy nutritious food to improve micronutrient situation in women and various age group and the goal no. 6.20 focused on health across life cycle approach including adolescent[11].

The Nutritional policy and strategy 2020 have also highlighted that as a long-term strategy to alter people's nutritional status and lower the prevalence of nutritional disorders, "school health and nutrition" should be put into practice. The development of schoolchildren's physical, mental, emotional, and academic status is the aim of the 2019 school health and nutrition strategy. One of the main strategic objective highlighted is to improve health and nutrition behavior and habits of the students and for this, the strategy has mentioned that life skills based health education is a must for achieving and sustaining behavior change [32].

The goal of MSNP (2018- 2022) is directly related with adolescent nutrition which states to improve the maternal, adolescent and child nutrition by scaling up essential nutrition-specific and sensitive interventions[33].

2.2. Compliance of WIFAS among adolescents

In order to determine the level of compliance with iron and folic acid supplementation (WIFAS) and its associated factors, a cross-sectional study of 424 adolescent girls in the Tamale Metropolis of Ghana was conducted. Compliance with the WIFAS was low (26.2%). By informing teenage girls about anemia and the advantages of the WIFAS, ensuring a steady supply of the WIFAS tablet, and involving their parents in the program, the compliance with the WIFAS was increased. The majority of the adolescent girls (60%) have missed taking the IFA tablet because it was not given to them out of concern from the teacher, and another 28.9% cited being absent from school as the reason[29].

Additionally, 66% of the respondents took IFA tablets four times in the most recent month, demonstrating their compliance with the requirement to do so. Again, only 19% of respondents reported using the tablet once or never, 2% reported using it twice, and 12.9% reported using it three times in the most recent month. Adherence to IFA supplementation among adolescents is influenced by sociodemographic factors[30].

In 2018, a cross-sectional survey of 60 high schools from 20 districts was carried out at two cities in Indonesia. It was reported that only 10% of ENT patients and 31% of EJ patients had WIFAS in the previous six months. The reasons people don't follow WIFA are that they forget, believe it is unnecessary, or are afraid of the side effects. In EJ and ENT, WIFAS coverage and adherence were insufficient[34].

In order to ascertain the prevalence of anemia and compliance with the WIFS, a study was conducted amongst Adolescents in 2022 in Selected Schools of Urban Puducherry, India. The percentage of adolescents who completed the WIFS was 67.7%, and anemia was significantly more common in late adolescents. This study focused on the idea that teacher supervision led to better WIFS program compliance[21].

Another study conducted to explore the determinants of high school female adolescents (14-16years) iron folic acid tablet consumption using a cross-sectional design with 274 students in Indonesia. The majority of schools (63.5%) distributed iron tablets to students without planning for group administration. IFA was followed by 45.6% of people, whereas 36.1% said they didn't think it was necessary and 12.4% reported side effects. The organization of iron supplementation by the school and classroom

instruction about anemia and IFA were the two main factors that affected females' adherence to IFA (OR=2.3, C. I=1.2-4.6)[19].

2.3 Knowledge on anemia and WIFAS among school-going adolescents

For a period of three months, a cross-sectional study was conducted in the 11 anganwadi centers and 4 WIFAS implemented schools at urban tertiary health center in India (August to October, 2018). Only 15% of participants in the study were aware of anemia. But only 17% of students and 67% of teachers were aware of the benefits of iron folic acid[35].

Parents and school-age children had discovered a significant amount of inaccurate information about anemia and dietary practices that were influenced by cultural and regional eating customs. The advantages of WIFAS for adolescent girls were unknown to them. They thought that the benefits of WIFAS were " blood added," "no loss of blood during birth," and "become fit." Girls and parents both reported experiencing side effects such as high blood pressure, dependence on medication, and nausea. The number of IFA tablets consumed each month and one's level of familiarity with anemia and IFA are statistically related to one another[30].

Only 30.7% of adolescent girls in a cross-sectional study in Ghana who were enrolled in school correctly identified anemia as a low blood level, qualifying them as being aware of the condition. A whopping 67.9% of teenage girls have never had anemia education. Adolescent girls (64.9%) were more likely than boys (35.1%) to have little or no knowledge of the IFAS program. About 48.3% of the teenage girls took the medication to prevent anemia. School health coordinators identified the lack of water in classrooms (18.8%) and adolescent girls' perception of the tablet as a family planning medication (80.8%) as the two main challenges[29].

2.4. Prevalence of anemia

In a study in rural schools in Mangalore, Karnataka, it was discovered that the prevalence of anemia was significantly lower in WIFAS implemented schools implementing the program (51%) than in not implemented schools not implementing the program (64.4%). According to the study, not implemented schools must also implement the WIFAS program in order to reduce the prevalence of anemia[20]. The

prevalence of anemia was found to be 39% in a study which is categorized as medium classification of prevalence of anemia according to WHO in a study conducted among adolescent girls in Ghana[30].

A study carried out in secondary schools at Delhi's WIFAS implemented schools. A control group and an intervention group were each assigned to different sections of the school (only WIFA). The HemoCue method was used to estimate hemoglobin (Hb) at the start and end of the study. The control group (26 percentage points) and the intervention group (54.7 percentage points) experienced a significant drop in anemia prevalence after the intervention (P 0.001). The study showed that WIFS with once-monthly health education was successful in lowering anemia prevalence in adolescent schools[36].

A 52-week community-based cross-sectional study was conducted in five Jhagadia tribal communities, supplementing IFA (DOTS) with trained Peer Educators. The HemoCue method was used to measure the levels of hemoglobin before and after the intervention. According to the results, anemia prevalence decreased overall in adolescent males from 64 to 39 percent and in adolescent girls from 79.5 to 58 percent. Hemoglobin changes before and after the intervention were discovered to be significantly related (P = <0.001. The study showed that WIFS with monthly health checks[22].

The RCT was conducted in West Delhi's where adolescent girls with mild (100-119 g/l) and moderate (70-99 g/l) anemia were divided into two groups at random. For 26 weeks, weekly supplementation under supervision was given. Because the prevalence of anemia decreased by 35.9% in Group A and 39.7% in Group B. IFA supplementation therefore proved to be a successful treatment for anemia in community level (P 0.001). The research showed that WIFS with monthly health education was successful[37].

The prevalence of anemia was found to be 62.7% in a cross-sectional analytical study done in 2021 among adolescent girls in particular schools in, India. More people with anemia were not taking their WIFS tablets as directed. The findings suggested methods to increase WIFS compliance, disseminate information about the advantages and disadvantages of taking IFA, and involve school teachers in the effort to combat adolescent anemia[21].

2.5. Weekly iron folic acid supplementation and hemoglobin level

The prevalence of anemia was found to have decreased overall from 73.3% to 25.4% in a large-scale effectiveness study on weekly iron and folic acid supplementation in adolescent girls conducted in Uttar Pradesh, India. The mean hemoglobin value increased from 11 to 11.8 g/dl after 6 months of weekly iron-folic acid supplementation (p .01)[38].

The second school (control group) received only WIFAS for six months, while the first school received weekly iron folic acid along with health education (intervention group). The intervention group's mean Hb increase was 2.3 g/dl as opposed to 1.9 g/dl in the control group after adjusting for diet, socioeconomic status, and personal hygiene history[26].

In the months of April, May, and June 2013, a community-based cross-sectional study was conducted in the tribal villages of Gujarat, India. Hemoglobin levels in teenage girls rose on average by 1.3 g/dl. Anemia prevalence among teenage girls dropped from 79.5% to 58%[22].

In the JJM Medical College's rural field practice area, in Davangere, 175 adolescent schoolgirls participated in a longitudinal study with a pre- and post-test design. At the beginning of the intervention, the prevalence of anemia was 38%; by the end of the year, it had dropped to 26%. A 0.37gm/dl increase in the mean hemoglobin concentration was observed[23].The study was focused on the effectiveness of the WIFAS program on adolescent girls to control anemia prevalence.

After a month of feeding, the weekly intervention group had a mean increase in hemoglobin of 1.0±0.8gm/dl and the daily intervention group had a mean increase of 1.0±0.7 gm/dl. In a weekly schedule, drug side effects were 8.3% while in a daily schedule, they were 13.35%. A weekly regimen has better treatment compliance than a daily regimen, making it more promising[18].

2.6. Dietary Diversity

Dietary diversity was measured using the FANTA 2016 1 day (24-h recall methods) diversity questionnaire, which included ten food groups covering nearly all foods

consumed. The MDD-W dichotomous indicator assesses whether or not women aged 15 to 49 years consumed at least five of the ten identified food groups the day before or the night before. The MDD-W was created as a stand-in indicator to reflect the sufficiency of micronutrients in women's diets. Food items from two or more of the fruit/vegetable food groups, as well as food from at least one animal-source group, are also very likely to be consumed by WRA groups who eat from five or more of the ten food groups[31].

Dietary variety is essential for adolescents because they need energy to develop physically and mentally. The likelihood of students attending government schools being low in dietary diversity was also 6.5 times higher than that of students attending private schools (AOR = 6.5, 95% CI: 2.87-14.95). A high score of 56.7% of adolescents and a low score of 43.3% have diverse diets[39].

IFA supplementation and hemoglobin did have a relationship, but it was not statistically significant (aMD= 0.21; 95% CI = - 0.07, 0.50; P=0.14). In comparison to boys, girls who took IFA supplements had higher hemoglobin levels. IFA supplemented girls had higher hemoglobin levels than non-supplemented girls. Receiving IFA tablets and eating a varied diet were linked favorably to math and reading aptitude as well as a lower risk of dropping out of school[40].

A study was carried out in India among non-pregnant rural women of reproductive age where their diverse dietary patterns, associated predictors, and connections to anemia was examined. For moderate or severe anemia, no statistically significant associations were found, though. A broader diet was found to be linked to a 30% lower risk of mild anemia (odds ratio = 0.7, 95% confidence interval: 0.5-0.98, p =.035). In rural India, the prevalence of mild anemia among women of reproductive age who are not pregnant was inversely correlated with diet diversity[41].

CHAPTER III: METHODOLOGY

3.1 Study design

A cross sectional study design was used in the study. This design assessed prevalence of anemia in a relatively short period of time and allowed to compare different variables at the same time.

3.2 Study method

The study method was quantitative method through the self-administered questionnaire. Hemoglobin estimation was done using the HemoCue method.

3.3 Study site

Tokha is an ancient historic city of Kathmandu valley in Bagmati province, which was formed in 2014 by merging five VDCs named as Dhapasi, Jhor Mahankal, Gongabhu, Tokha Chandeswori and Tokha Saraswoti.The total geographic area is 16.19 sq.km with total household of 32500 and total population is 149000. The study site was the all WIFAS implemented schools and randomly selected not implemented schools of Tokha municipality. The study site was selected because such type of study has not been carried out in this municipality till date and is feasible for the researcher in terms of time and distance. Also, it is the semi-urban area that includes people with various socio-demographic characteristics so the findings could be more generalizable.

3.4 Study participants

The study population was adolescent girls aged 10-19 years from grade 6 to 10 who were enrolled in all the WIFAS implemented and not implemented schools of Tokha municipality.

3.5 Inclusion and exclusion criteria

Inclusion criteria

Adolescent girls of age group 10-19 years was included in the study only from grade 6-10 from WIFAS implemented and not implemented schools.

3.6 Sample size

The proportion of outcome for two groups was calculated from a school based study conducted among adolescent girls in India[20].

$n=(Z_{(1-\alpha/2)} + Z_{(1-\beta)})^2 * p_1 (1-p_1)+p_2 (1-p_2)/(p_1-p_2)^2$ where,

proportion of outcome from group 1 (p_1) = 64.4%=0.644

proportion of outcome from group 1 (p_2) = 51%=0.51

power (1-β) =80%=0.8

Z_{alpha} value=1.96 at 95 % Confidence interval

Z_{beta} value=0.84 at corresponding 80% power

Therefore, putting the respective values,

The sample size for group 1($_{n1}$) =188.16

The sample size for group 2 ($_{n2}$) =188.16

With design effect 1.5 and adding a 10% non-response rate, the total sample size was 602.

3.7 Sampling procedure

All WIFAS implemented schools and nearby not implemented schools of the same ward were selected randomly. The adolescent girls from grade 6 to 10 were included for PPS sampling. The WIFAS group was determined on the basis of information obtained from WIFAS 'compliance card' or register maintained at the school. After obtaining parental written consent and child assent, data was collected using a semi-structured questionnaire.

The adolescent girl students list was collected from each schools from grades six to ten before the data collection then by using PPS technique the number of class cluster was determined. After selection of grade cluster, all adolescent girls were chosen from each cluster for Hb test and asked to fill the self-administered questionnaire. The six to ten grades were the clusters for my study.

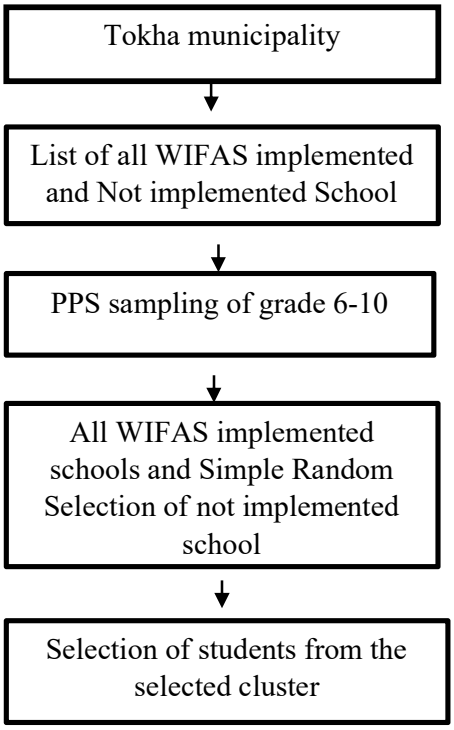

Figure 2: Sampling procedure

3.8 Data collection tools and techniques

The self-administered questionnaire was used for data collection. The completeness and consistency of the questionnaire was ensured through the opinions of experts in the field of nutrition and lab technician was used for hemoglobin estimation. Data collection was done by researcher herself. Data obtained from the questionnaire was entered into epidata and analysis was carried out in SPSS 25.

A standard questionnaire from the Adolescent Nutrition Health Survey 2014 was used to find the socio-demographic information and knowledge on anemia and WIFAS and dietary diversity and compliance related questionnaire were adapted from different published articles. HemoCue Hb301was used for hemoglobin estimation as it is a diagnostically accurate and recommended by WHO, 2018 to diagnose anemia.

Hemoglobin measurement

The HemoCue system was used for hemoglobin estimation. Well trained lab technician performed blood sample collection process. Each respondent and their parent's consent

was taken before blood draw for estimation. To draw blood from the finger, a sterile lancet was used. Blood was collected on a microcuvette. The microcuvette was set to zero and then inserted into the HemoCue device. The observed hemoglobin level on each respondent was noted on the questionnaire and communicated to them.

Data collection techniques

Approval was taken from concerned authorities i.e. school, municipality health and education section. Students were approached a day before the data collection. Parents' consent form was given to the students to get permission from their parents and were asked to submit the consent form on the day of data collection. Those students who got their parents' permission were included in the study and written assent was taken from them. Students were asked to fill the questionnaire only after they agreed to participate in the study. Before entering the data, the completed questionnaires were reviewed for completeness.

3.9 Data management and analysis

First, the gathered data was manually compiled and verified. After that, EpiData 3.1 was used to code and enter the data. Exporting the data into SPSS (Statistical Package for Social Science) version 25 allowed for data analysis. Bivariate and multivariate logistic regression analysis was carried out to identify association between anemia and independent variables.

A Chi-square tests was done for bivariate analysis to assess associations between the variables. When the p-value for the bivariate analysis was less than 0.05, covariates were taken into account for the logistic regression.

3.10 Validity and Reliability

3.10.1 Validity

The weekly iron folic acid supplementation card or school register was viewed if available to validate the adherence. The questionnaire was created based on the study's objectives and variables, with required modifications in the local context, using related literature and applicable standard questionnaires and instruments. Following the pre-test, certain changes were made to the semi structured questionnaire with the careful

consultation and supervision of supervisors. Dietary diversity questionnaire was adapted from FANTA, FAO, 2016. Content validity was ensured by developing the questionnaire according to the objectives of the study and study variables. Research supervisors were consulted while developing the tools. The tool was translated to Nepali language.

In order to verify the accuracy of the HemoCue machine, the researcher and lab technician first withdrew blood from their own fingers and estimated their hemoglobin levels. Results for their Hb was the same as earlier test performed in Laboratory.

3.10.2 Reliability

The completeness and consistency of the questionnaire was ensured. The pretesting of the tool was done in one WIFAS implemented and one not implemented school in nearby Tarkeshwor municipality, Kathmandu and further modification was done with the guidance of supervisor.

3.11 Ethical consideration

Ethical approval was taken from Institutional Review Committee, Central Department of Public Health, Institute of Medicine (IoM). The permission was taken from Tokha Municipality Office and concerned school authority and consent and assent was taken from the participants and parents before collecting data. The objectives of the study and instruction to fill the questionnaire was clearly stated to the participants. Confidentiality of the participants was maintained. The collected data was saved in computer based file and the personal identifiers of students were removed.

Participants received adequate information about the study, potential advantages, and potential risks. and she was clearly stated and counselled about the blood draw procedure from the tip of her finger, timing and hemoglobin level and status of anemia. In case of severity, she was referred to nearby health facility with proper counselling and nutrition education on essence and regular intake of iron rich foods and weekly iron folic acid supplementation.

The voluntary participation and the right to refuse at any stage was respected.

3.12 Limitations of the study

Since the tool is self -administered questionnaire, there might be recall bias to remember the number of the tablets feed in the past one month.

The impact of deworming on the anemia prevalence couldn't be assessed.

The Sahli method was considered to be more validated tool to diagnose hemoglobin but HemoCue system was used in this study.

CHAPTER IV: RESULTS

4.1 Characteristics of the study population

4.1.1 Socio Demographic information of the study population

The sociodemographic findings are further divided into individual characteristics and family background which is presented in Table below.

A. Individual characteristics of the adolescents

A total of 602 school going adolescent girls of grade six to ten from WIFAS implemented and not implemented schools with 100% response rate. The individual characteristics included grade, first age at menarche, marital status, ethnicity and religion of the participants. The mean age and menarche was 14.13 (±1.5) years and 12.29 (±0.92) years respectively. All the respondents were unmarried.

Table 1 presents the data regarding the individual characteristics of the participants. The age of the students has been categorized into 10-14 years (early adolescents) and 15-19 years (late adolescents) where late adolescents were majorly participated in the study. About half of the respondents were Janajati (49.8%) followed by Brahmin/Chhetri (40.4%), Dalit (7.3%), Madhesi (2%) and Muslim (0.5%). The majority of the participants were Hindu (62.6%) followed by Buddhist (27.4%), Christian (6.8%), Kirat (1.7%) and Muslim (1.5%).

Table 1: Individual characteristics of the adolescents (n=602)

Characteristics	Number	Percent (%)
Age		
15-19 years (late adolescent)	242	40.2
10-14 years (early adolescent)	360	59.8
Mean age ± SD	14.13(±1.5) years	
Grade		
Six	70	11.6
Seven	132	21.9
Eight	171	28.4
Nine	146	24.3
Ten	83	13.8
First Age of menstruation (years) (n=523)		
Eleven	104	19.9
Twelve	223	42.6
Thirteen	134	25.6
Fourteen	62	11.9
Mean age of menarche	12.29((±0.92) years	
Ethnicity		
Janajati	300	49.8
Brahmin/Chhetri	243	40.4
Dalit	44	7.3
Madhesi	12	2
Muslim	3	0.5
Religion		
Hindu	377	62.6
Buddhist	165	27.4
Christian	41	6.8
Kirat	10	1.7
Muslim	9	1.5

B. Family Background of the adolescents

The adolescent's mother and father with no education was 32.7% and 18.3% respectively followed by basic education 31.9 % and 25.1 %. Home making (60.3%) was the main occupation of mothers followed by business (12.8%) and farming (7.6%) whereas majority of the adolescent's fathers were involved in business (34.1%) followed by daily wages (17.8%) and farming (13.3%). More than half of the respondents were from nuclear/small family (64.5%).

Table 2: Family characteristics of the adolescents (n= 602)

Characteristics	Number	Percent(%)
Family type		
Nuclear	388	64.5
Extended	214	35.5
Mother's education		
No education	197	32.7
Basic education	192	31.9
Secondary	146	24.3
More than secondary	67	11.1
Father's education		
No education	110	18.3
Basic education	151	25.1
Secondary	200	33.2
More than secondary	141	23.4
Father's occupation		
Private business	205	34.1
Government Service	124	20.6
Daily wages	107	17.8
Agriculture	80	13.3
Housework	72	12
Foreign Employment	14	2.3
Mother's occupation		
Housemaker	363	60.3
Private business	77	12.8
Government Service	69	11.5
Agriculture	46	7.6
Daily wages	43	7.1
Foreign Employment	4	0.7

4.1.2 Prevalence of anemia

A. Prevalence of anemia among WIFAS implemented and non-implemented schools

All the adolescent girls in the study were tested for Hemoglobin. Hemoglobin test using HemoCue machine 301 was done in 301 adolescent girls each from WIFAS implemented and not implemented schools. The overall prevalence of anemic was found to be 17.4 %. Among the total sample, 63 (20.9%) and 42 (14%) adolescent girls from WIFAS not implemented and implemented schools were anemic respectively whereas 238 (79.1%) and 259 (86%) were non-anemic respectively.

Hemoglobin level among adolescent school girls was in the range of 6.70g/ dl to 18.0g/dl, with a mean value of 13.30± (SD 1.42). The mean hemoglobin level was found to be 13.29 g/dl and 13.32 g/dl in not implemented and implemented schools respectively. The minimum to a maximum range of hemoglobin was 8.4g/dl to 16.6 g/dl and 6.7 g/dl to 18 g/dl in non-implemented and implemented schools respectively.

Table 3: Prevalence of anemia among WIFAS implemented and non - implemented schools (n=602)

Type of School	Anemia Status	
	Anemic n (%)	**Non Anemic n (%)**
Non-implemented	63 (20.9)	238 (79.1)
Implemented	42 (14)	259 (86)

B. Distribution of severity of anemia among the WIFAS implemented and non-implemented schools

Among the total of 42 anemic adolescent girls at WIFAS implemented school, mild, moderate and severe anemia was found to be 24 (8%), 17 (5.7%) and 1 (0.3%) respectively. On the other hand, among the total 63 anemic adolescent girls of not implemented school, mild and moderate anemia was found in 48 (15.9%) and 15 (5%) respectively. The WIFAS not implemented school did not have a problem of severe anemia.

Table 4: Distribution of anemia among WIFAS implemented and non-implemented schools (n=602)

Grading of anemia (Hb in gm/dl)	Implemented schools n (%)	Non-implemented schools n (%)	Total n (%)
Normal (≥12)	259 (86)	238 (79.1)	497(82.5)
Mild (11-11.9)	24 (8)	48 (15.9)	72(12)
Moderate (8-10.9)	17 (5.7)	15 (5)	32(5.3)
Severe (<8)	1 (0.3)	0	1(0.2)

4.1.3 Compliance on WIFAS

The compliance-related questions were compiled only from the WIFAS implemented schools where the WIFAS program has been implemented in Tokha municipality. In the implemented schools, 225 (74.7%) of adolescent girls consumed total four tablets in four weeks. The noncompliance in the study was 76 (25.3%). The moderate level of compliance (74.7%) was observed among the schools implementing the WIFAS program. The mean hemoglobin level among compliant was 13.53 g/dl and among non-compliant it was 12.68 g/dl.

Table 5: Compliance on WIFAS implemented schools (n=301)

Characteristics	Number	Percent (%)
Noncompliant	76	25.3
Compliant	225	774.7

4.1.4 Compliance and its associated factors

The overall compliance in the study was found to be 74.7% and non-compliance was 25.3%. Among those currently taking the IFA tablet in implemented schools, more than half of the respondents 52.5% cited advice from their teacher to take tablets and 15.6% cited friends are taking as the reason for taking the IFA tablet. Those who were in direct supervision of teacher/supervisor were 78.7% compliant to WIFAS.

About 25.3% girls missed the tablet. Out of which 7.1% have taken 0-1 tablet and 18.2% have taken 2-3 tablets in the last one month. Most (16%) were absent from school and 5% cited the side effects for missing the tablets. Bad taste was cited by 4% for missing the tablets in the past one month.

Challenges: About 40% of the respondents faced the challenges where irregular supply of WIFAS was cited by 26.9% followed by lack of health education on WIFAS by 25.6%.

Side effects: With multiple responses possible, any one of the side effects were reported by 92% adolescents and 8% did not report any. More than two third experienced stomach pain.

Perceived benefits: Majority of the respondents (64.1%) cited that girls were given the WIFAS in order to prevent from anemia. With multiple responses possible, majority (79.2%) of the respondents thought girls menstruate each month and 24.4% cited girls were at higher risk to anemia than boys. About 65% of the respondents thought the IFA tablet helped to increase the blood volume and 26.6% thought IFA helped to increase concentration and performance.

Table 6: Descriptive characteristics of factors associated to compliance (n=301)

Characteristics	Number	Percent(%)
Age		
Late adolescent (15-19)	154	51.2
Early adolescent (10-14)	147	48.2
Grade		
Six	42	14
Seven	42	14
Eight	73	24
Nine	87	28
Ten	57	20
Ethnicity		
Brahmin/Chhetri	98	32.5
Dalit	26	8.5
Janajati	168	56
Madhesi	6	2
Muslim	3	1
Religion		
Hindu	166	55
Buddhist	99	33
Muslim	4	1
Kirat	4	1
Christian	28	10
Type o family		
Small	189	62.8
Extended	112	37.2
Mother's education		
No education	133	44
Basic education	109	36
Secondary	45	15
More than secondary	14	5
Father's education		
No education	79	26
Basic education	96	32
Secondary	90	30
More than secondary	36	12

Characteristics	Number	Percent(%)
Father's occupation		
Housework	47	15
Government Service	42	14
Private business	66	22
Foreign Employment	6	2
Daily wages	76	26
Mother's occupation		
Agriculture	31	10
Housework	196	66
Government Service	26	8.5
Private business	15	4.5
Daily wages	33	11
Knowledge on anemia		
Poor Knowledge	123	49.9
Good Knowledge	178	59.1
Knowledge on WIFAS		
Poor Knowledge	65	21.6
Good Knowledge	236	78.4

4.1.5 Knowledge on anemia and WIFAS

A. Knowledge on anemia

In the study, only 64.6% adolescent girls were able to correctly mention anemia as inadequate blood level. Intake of iron rich foods was considered by 46% of adolescents as the treatment measure of anemia. Reduced physical activity was considered as a major consequence of anemia by 37% of the respondents (see details in annex X).

The knowledge of anemia was calculated by adding all relevant 19 knowledge items. A correct answer for each item was scored as "1" and incorrect answer was scored as "0." The knowledge score was 0 (minimum) to 12 (maximum). The median mark obtained on knowledge of anemia was six.

About 59.1% and 54.2% of the respondents from WIFAS implemented school and not implemented schools respectively had good knowledge on anemia.

Table 7: Poor and good knowledge on anemia (n=602)

Characteristics	Knowledge on anemia	
	Poor knowledge n (%)	Good knowledge n (%)
Non-implemented schools	138 (45.8)	163 (54.2)
Implemented schools	123 (40.9)	178 (59.1)

C. Knowledge on WIFAS

The adolescent girls from WIFAS implemented girls were two times more aware in compared to not implemented schools to report girls are at high risk of anemia. Regarding the benefits, WIFAS helped to increase the blood level was reported by 82% adolescent girls in WIFAS implemented schools and 49% adolescent girls in not implemented schools. The adolescent's knowledge on food items that reduces the iron absorption was comparatively lower. Stomach pain was considered major side effect as reported by 44% of adolescents (see details in annex X).

The knowledge of weekly iron-folic acid supplementation was calculated by adding up all 15 relevant items. Each item's correct response received a score of "1" and incorrect answer was scored as "0". The median mark obtained was five with the knowledge score 0 (minimum) to 10 (maximum). About 78.4% and 46.5% of the respondents from WIFAS implemented and not implemented schools were considered having good knowledge on WIFAS.

Table 8: Poor and good Knowledge on WIFAS (n=602)

Characteristics	Knowledge on WIFAS	
	Poor knowledge n (%)	Good knowledge n (%)
Non-implemented schools	161 (53.5)	140 (46.5)
Implemented schools	65 (21.6)	236 (78.4)

4.1.6 Dietary diversity

On the basis of food groups divided as per MDD-W and 24-hour dietary recall, this study had shown that cereals were consumed as universal; 96.2% of participants had

consumed pulses within last 24 hours, 69.9% dairy, 45% other fruits, 31.7% dark green leafy vegetables, 42.5% flesh, 40.7 % other sources of vitamin and minerals and 28.1% nuts and seeds (see details in annex X).

This study further concluded that adolescent girls from not implemented schools had comparatively lower inadequate food diversity than the WIFAS implemented schools accounted for 25.2% and 29.2% respectively. Among total participants, mean food group consumption was 5.35 with SD ± 1.39.

Table 9: Adequate and inadequate dietary diversity (n=602)

Characteristics	Dietary Diversity	
	Inadequate food diversity n (%)	**Adequate food diversity n (%)**
Non-implemented	76 (25.2)	225 (74.8)
Implemented	88 (29.2)	213 (70.8)

4.2 Analysis of association of independent variables with anemia

This section presents the association between dependent (prevalence of anemia) and independent variables (sociodemographic, Knowledge, compliance, and diet-related variables). Bivariate analysis was done to find out the association between these variables. For this, cross-tabulation was done along with chi-square test and calculation of p-value to find out the significance of association.

4.2.1 Association between socio-demographic variables and anemia

Cross-tabulation of various socio-demographic factors with anemia showed a significant association with age of adolescents, grade, type of school, education of mother, education of father, and occupation of the mother.

The cross-tabulation of the age of adolescents with the prevalence of anemia showed that late adolescents were 1.58 times higher odds of being anemic as compared to early adolescents. The result was statistically significant (p-value 0.032). Likewise, the students studying in not implemented schools have 1.6 times higher odds of being anemic as compared to those who study in WIFAS implemented schools.

Regarding the grade, the odds of anemia in grades 9-10 were 1.7 times higher as compared to the odds of anemic in grades 6-8 which showed significant association at p value 0.014. Respondents of below secondary education mothers were found 3.68 times more likely to be anemic (OR 3.680, 95% CI 2.083-6.406) in comparison with respondents of secondary and above mothers which was significant. Similarly, in the cross-tabulation, education of father, occupation of mother had noteworthy relationship with anemia.

Table 10: Association between socio demographic factors and anemia (n=602)

Characteristics	Anemic n (%)	Non-anemic n (%)	p-value	OR	95% CI
Age					
15-19	52 (21.5)	190 (78.5)	0.032*	1.6	1.1-2.4
10-14	53(14.7)	307 (85.3)		Ref.	
Type of school					
Non-Implemented	63 (20.9)	238 (79.1)	0.024*	1.6	1.1-2.5
WIFAS implemented	42 (14)	259 (86)		Ref.	
Grade					
9-10	51(22.3)	178 (77.7)	0.014*	1.7	1.1-2.5
6-8	54 (14.5)	319 (85.5)		Ref.	
Mothers' education					
Below secondary	89 (22.9)	300 (77.1)	<0.001*	3.7	2.1-6.4
Secondary and above	16 (7.5)	197 (92.5)		Ref.	
Father's education					
Below Secondary	78 (29.9)	183 (70.1)	<0.001*	4.9	3.1-7.9
Secondary and above	27(7.9)	314 (92.1)		Ref.	
Ethnicity					
Non-Hindu	35 (15.6)	190 (84.4)	0.346	0.8	0.6-1.3
Hindu	70 (18.6)	307 (81.4)		Ref	
Type of family					
Extended	42 (19.6)	172 (80.4)	0.294	1.2	0.8-1.9
Small	63 (16.2)	325 (83.8)		Ref.	
Mother's occupation					
Agriculture	15 (32.6)	31(67.4)	0.005*	2.5	1.3-4.8
Non-agriculture	90 (16.2)	466 (83.8)		Ref.	
Father's occupation					
Agriculture	16 (20)	64 (80)	0.517	1.2	0.7-2.2
Non-agriculture	89 (17)	433 (83)			

4.2.2 Association between compliance and anemia

Among the total compliant respondents 225 (74.7%), 8.9% were anemic and among the total non-compliant 76 (25.3%), 28.9% were anemic. There was statistically significant relationship between compliance and anemia.

Four times as many non-compliant people had anemia. Similarly, the mean hemoglobin level among compliant and non-compliant was 13.53 g/dl and 12.68 g/dl which was statistically significant at 0.04 level of significance.

Table 11: Association between compliance and anemia (n=301)

Characteristics	Anemic n (%)	Non-anemic n (%)	p-value	OR	95% CI
Non-compliant	22 (28.9)	54 (71.1)	<0.001*	4.2	2.1-8.2
Compliant	20 (8.9)	205 (91.1)		Ref	

4.2.3 Association of compliance and associated factors

The odds of compliant was 1.9 times higher in the grade 6-8 in compared to odds of compliant in 9-10 grade adolescents. Similarly, the odds of compliant was higher in the extended family were significant at p value 0.005. There was no significant relationship on knowledge on anemia with compliance to WIFAS. Those having the good knowledge on WIFAS was 1.9 times compliant in compared to poor knowledge. This is evident with significant ($\chi 2$=4.5, OR= 1.9, CI 1.1-3.4, p value of 0.034). Moreover, among the government schools, the schools where there was the provision of school health nurse, the compliant was 2.4 times higher in compared to schools where there was no school health nurse.

Table 12: Associated factors with Compliance (n=301)

Characteristics	Compliance of WIFAS		P value	OR	95%CI
	Compliant n (%)	Noncompliant n (%)			
Age					
10-14	115 (78.2)	32 (21.8)	0.174	1.438	0.9-2.4
15-19	110 (71.4)	44 (28.6)			
Grade					
6-8	127 (80.9)	30 (19.1)	0.01*	1.987	1.2-3.4
9-10	98 (68.1)	46 (31.9)		Ref.	
Education of mother					
Secondary and above	48 (81.4)	11 (18.6)	0.193	1.602	0.8-3.3
Below secondary	177 (73.1)	65 (26.9)		Ref.	
Education of father					
Secondary and above	100 (79.4)	26 (20.6)	0.118	1.538	0.9-2.7
Below secondary	125 (71.4)	50 (28.6)		Ref.	
Ethnicity					
Non-Dalit	153 (75.4)	71 (25.8)	0.722	1.105	0.7-1.9
Dalit	72 (73.5)	26 (26.5)		Ref.	
Religion					
Hindu	121 (72.9)	45 (27.1)	0.410	0.801	0.5-1.4
Non-Hindu	104 (77)	31 (23)		Ref.	
Type of Family					
Extended	94 (83.9)	18 (16.1)	0.005*	2.312	1.3-4.2
Small	131 (69.3)	58 (30.7)		Ref.	
Mothers occupation					
Non-agriculture	205 (75.9)	65 (24.1)	0.166	1.735	0.8-3.8
Agriculture	20 (64.5)	11 (35.5)		Ref	
Father occupation					
Non-agriculture	178 (75.1)	59 (24.9)	0.785	1.091	0.6-2.1
Agriculture	47 (73.4)	17 (26.6)		Ref.	
Knowledge on anemia					
Good	140 (78.7)	38 (21.3)	0.061	1.647	0.9-2.8
Poor	85 (69.1)	38 (30.9)		Ref.	
Knowledge on WIFAS					
Good	183 (77.5)	53(22.5)	0.034*	1.891	1.1-3.4
Poor	42 (64.6)	23(35.4)		Ref.	
School health nurse					
Available	183 (78.9)	49 (21.1)	0.003*	2.4	1.3-4.3
Not available	42 (60.9)	27 (39.1)		Ref.	

4.2.4 Association of knowledge on anemia and WIFAS with anemia

The odds of anemia among adolescent girls with poor knowledge on anemia was 1.5 times higher in compared to odds of anemia among adolescents with good knowledge on anemia. Similarly, the school not implementing the WIFAS program was found to be 1.6 times higher odds of anemic in compared to WIFAS implemented schools implementing WIFAS program. This finding was statistically significant at P value of 0.024. However, the knowledge on anemia was not statistically significant with the type of WIFAS implemented and not implemented school.

Table 13: Association of knowledge on anemia and WIFAS with anemia (n=602)

Characteristics	Anemic n (%)	Non anemic n (%)	P value	COR	CI
Knowledge on anemia					
Poor knowledge	55 (21.1)	206 (789)	**0.040***	1.554	1.2 - 2.4
Good knowledge	50 (14.7)	291 (85.3)		Ref.	
Knowledge on WIFAS					
Poor knowledge	49 (21.7)	177 (78.3)	**0.034***	1.582	1.1 - 2.4
Good knowledge	56 (14.9)	320 (85.1)		Ref.	

The odds of anemia among adolescents with poor WIFAS knowledge was 1.58 times higher in compared to odds of anemia in adolescents with good WIFAS knowledge. Similarly, the school not implementing the WIFAS program was found to be 1.6 times higher odds of anemic in compared to WIFAS implemented schools implementing WIFAS program. This finding was statistically significant at p value of 0.024. In the same way, the knowledge on WIFAS was also statistically significant with the type WIFAS implemented and not implemented school. Hence, on the basis of statistical inference, we can conclude that there is a significant association between both type of school and WIFAS knowledge with the anemia

4.2.5 Association of dietary diversity with anemia

Regarding the dietary diversity there were statistically significant association between dietary diversity and anemia among adolescent girls; The study showed that participants with not adequate diet diversity were 13.80 times to be anemic (OR 13.80 at 95% CI

8.411-22.61) in compared to participants with adequate dietary diversity. The result was statistically significant at (p-value <0.001). However, the WIFAS implemented and not implemented schools do not have significant relationship with the dietary diversity.

Table 14: Association of adequate and inadequate dietary diversity with anemia (n=602)

Characteristics	Anemic n (%)	Non Anemic (n%)	P value	OR	CI
Inadequate food diversity	78(47.6)	86(52.4)	<0.001*	13.806	8.4-22.6
Adequate food diversity	27(6.2)	411(93.8)		Ref	

4.3 Multivariable analysis/Adjusted relationship

After the application of bivariate analysis, ten significant variables were subjected to multivariate analysis in a second phase. Factors that were entered in multivariate analysis were age, type of school, grade, education of mother, education of father, occupation of mother, compliance, knowledge on anemia, knowledge on WIFAS and dietary diversity that have shown the significant association with prevalence of anemia.

Adjustment of the factors which could be possible confounders to the dependent variables was done with binary logistic regression. The test of multi-collinearity was done by checking Variation Inflation Factor. It was identified in this study by examining variance inflation factor (VIF). The cutoff value for tolerance is 0.10 and VIF was 10 which means the variable whose VIF is greater than 10 should be excluded from multivariate analysis.

Table 15: VIF of independent variables

Variables	VIF
Age	1.659
Grade	1.664
Mothers education	1.459
Fathers education	1.407
Mothers occupation	1.025
Compliance	1.081
Knowledge on anemia	1.028
Knowledge on WIFAS	1.047
Dietary diversity	1.041

The above table shows that the independent variables are under the cut off points of VIF i.e. all the variables are less than 10 which means that the variables are not inter-associated and are eligible for multivariate analysis.

While applying the multivariate analysis, with ($p= 0.753> 0.05$), the predictability of the logistic regression equation was 85.7 percent.

From the multivariate analysis, education of father (AOR 3.27, 95% CI (1.7-6.5), Knowledge on WIFAS (AOR 1.82, 95% CI 1.1-3.1) and dietary diversity (AOR 12.3, 95% CI 7.2-20.9) were found to be significantly associated at (p value<0.05) with prevalence of anemia among school going adolescent girls in Tokha municipality (Table 16).

Table 16: Adjusted relationship of independent variables with the anemia

Characteristics	Bivariate analysis		Multivariate analysis	
	COR (95%CI)	P value	AOR (95%CI)	P value
Age				
15-19	1.6 (1.1-2.4)	0.032	0.70 (0.3-1.5)	0.337
10-14	Ref.		Ref.	
Grade				
9-10	1.7 (1.1-2.6)	0.014	1.92 (0.9-3.9)	0.081
6-8	Ref.		Ref.	
Mother's education				
Below secondary	3.7 (2.1-6.4)	<0.001	1.21(0.5-2.7)	0.642
Secondary and above	Ref.		Ref.	
Father's education				
Below secondary	4.9 (3.1-7.9)	<0.001	3.27 (1.7-6.5)	0.001*
Secondary and above	Ref.		Ref.	
Occupation of mother				
Agriculture	2.5 (1.3-4.8)	0.005	0.92 (0.4-2.1)	0.857
Non-agriculture	Ref.			
Knowledge on anemia			Ref.	
Poor knowledge	1.6 (1.02-2.4)	0.04	1.5 (0.9-2.6)	0.104
Good knowledge	Ref.		Ref.	
Knowledge on WIFAS				
Poor knowledge	1.6 (1.0-2.4)	0.034	1.8 (1.1-3.1)	0.027*
Good knowledge	Ref.		Ref.	
Dietary diversity				
Inadequate	13.8 (8.4-22.6)	<0.001*	12.3 (7.2-20.9)	<0.001*
Adequate	Ref.		Ref.	

The multivariate analysis showed the adolescent girls of below secondary father education was three times higher odds of being anemic in compared to father education with secondary and higher level. Similarly, the odds of anemia among the adolescent girls with poor WIFAS knowledge was 1.8 times higher in compared to good WIFAS knowledge. Likely, the adolescent girls with inadequate dietary diversity was12 times higher odds of being anemic in compared to the adolescent girls with adequate dietary diversity.

Similarly, the grade, type of family, knowledge on WIFAS and provision of school health nurse were associated factors statistically significant with compliance to WIFAS.

Table 17: VIF of independent variables with compliance

Variables	VIF
Grade	1.004
Type of family	1.012
Knowledge on WIFAS	1.014
Provision of school health nurse	1.078

The above table showed that the independent variables were under the cut off points of VIF i.e. all the variables are less than 10 which means that the variables are not inter-associated and are eligible for multivariate analysis. While applying the multivariate analysis, the model to be fit (p= 0.143> 0.05). Predictability of the logistic regression equation was 74.8 percent.

From the multivariate analysis, grade (AOR 2.8, 95% CI 1.5-5.1), type of family (AOR 2.3, 95% CI 1.2-4.3), and provision of school health nurse (AOR 3.4, 95% CI 1.7-6.5) have found to have a significant relationship with the compliance in government schools at Tokha municipality.

Table 18: Adjusted relationship of independent variables with the compliance

Characteristics	Bivariate analysis		Multivariate analysis	
	OR (95%CI)	P Value	AOR (95%CI)	P value
Grade				
6-8	1.9 (1.2-3.4)	0.01	2.8 (1.5-5.1)	**0.001***
9-10	Ref		Ref	
Type of family				
Extended	2.3 (1.3-4.2)	0.007	2.3 (1.2-4.3)	**0.007***
Small	Ref		Ref	
Provision of school health nurse				
Available	12.4 (1.3-4.3)	0.003	3.4 (1.7-6.5)	**<0.001***
Not available	Ref		Ref	

The multivariate analysis has shown that the odds of compliance was two times higher in grade 6-8 in compared to grade 9-10. Similarly, the odds of compliance were more than two times higher among adolescent girls who were from extended family in compared to small family. Moreover, the WIFAS implemented schools where there was provision of school health nurse, the odds of compliance were higher among the adolescent girls. The results were statistically significant with P value <0.001.

CHAPTER V: DISCUSSION

The Weekly Iron and Folic Acid Supplementation (WIFAS) Program is a low-cost preventive measure to help adolescent girls who are planning to become pregnant avoid anemia[23]. According to the current study, anemia was generally prevalent among adolescent girl students from grade sixth to tenth accounting 17.4 %. The prevalence of anemia was higher in WIFAS not implemented schools (20.9%) in compared to WIFAS implemented schools (14%). The differences in the prevalence of anemia among WIFAS implemented and not implemented schools were statistically significant. This might be because WIFAS program has been implemented for more than a year and adolescent girls had consumed more than two rounds of tablets in the study area.

This is Nepal's first comprehensive study looking into adolescent anemia after the implementation of WIFAS program by government of Nepal in WIFAS implemented and not implemented schools at Tokha municipality. It demonstrates that 17.4% of school going adolescent girls between the ages of 10 and 19 had anemia overall. The results give a national estimate of adolescent anemia, which can be used as a benchmark to assess the effectiveness of the Weekly Iron Folic Acid Supplementation nutrition programs that are currently in place and to calculate the National Burden of Disease for Nepal. Additionally, in the context of Nepal that lacks primary data at the national level, this finding could sheds light on the associated factors that contribute to adolescent girls' anemia.

Anemia prevalence among adolescent girls decreased from 79.5% to 58%, according to a study conducted by Shobha P. Shah, demonstrating the effectiveness of WIFAS in reducing anemia[22]. Likely, in our study, WIFAS-implemented school girls had a lower prevalence of anemia than girls from not implemented schools. Our result was in line with studies on young people from Kerala and Nepal found that the prevalence of anemia was, respectively, 31.4% and 31%, which is relatively low[2,24]. Different studies have revealed the effectiveness of WIFAS in reducing the prevalence of anemia conducted throughout the countries[20,23,26, 36, 38]. The prevention and treatment of iron deficiency anemia have been successfully demonstrated to be aided by iron supplementation, particularly in school going adolescent girls. WIFAS intake can

ensure that students' dietary intake of iron is adequate when schools give them iron supplements.

According to our study of girls in WIFAS implemented schools, 5.7% of them had moderate anemia and 8% had mild anemia. A mild anemia rate of 15.9% and a moderate anemia rate of 5% were found in the WIFAS not implemented school girls. In contrast, the study by Shahul Hameed found that among adolescent girls' anemia rates for mild, and moderate cases were, respectively, 43.3% and 7.7% in WIFAS implemented schools and 48.1% and 16.3% in WIFAS not implemented schools[20]. These differences in the anemia rates is due to the implementation of WIFAS program in government schools, where the girls were directly benefited from the tablets that fulfil the iron requirements of the body.

Anemia prevalence decreased among adolescents enrolled in the WIFAS program from 38% to 26%, according to a longitudinal study by Angadi N. and Balu PS[23]. In the study conducted there was a greater incidence of anemia in the age group of 12 to 14 years (35.3%) compared to that of individuals older than 14 years (31.1%)[42]. The differences in the age group was statistically significant. These findings satisfy the findings of NDHS 2016 that has focused anemia prevalence decreases as people age, where 15-19 years were 44% anemic as compared to 20-24 years (36%)[16]. However, the findings of this study were in align with findings studied by Wangaskar, et al., where the late adolescents were more likely to have anemia than early adolescents[21]. Also, in comparison to young (10–14 years) and male adolescents, the prevalence was especially high among 15–19 year olds (37%, 95%CI: 33.5, 40.6) and female adolescents (38%, 95%CI: 34.0, 41.8)[24]. This might be due to poor compliance to WIFAS among late adolescents and Inconsistent use of IFA tablets and might be due to increased menstrual blood loss.

Different studies have revealed that there is positive association between intake of WIFAS and Haemoglobin level. The overall results indicate that anemia prevalence decreased from 79.5% to 58% among adolescent girls with the average increase in hemoglobin was 1.3 g/dl for adolescent girls. Change in hemoglobin after three months WIFAS intervention showed a significant association[22]. Similarly, the overall prevalence of anemia decreased from 73.3% to 25.4% in 4 years. There was a significant correlation between hemoglobin levels where the hemoglobin level

increased from 10.5 to 11.7 g/dl in six months of intervention [38]. At the beginning of the intervention, the prevalence of anemia was 38%; by the end of the year, it had dropped to 26%. The average hemoglobin level rose by 0.37 grams per deciliter and increased to 0.37 g/dl in a year interventions[23]. Similar findings for low prevalence of anemia in WIFAS implemented schools in the present study area. This variation in IFA supplementation duration and compliance rate accounts for the difference in reduction of anemia prevalence. Increases in hemoglobin levels vary depending on how frequently and for how long WIFAS is used.

Regarding the socio demographic characteristics, the mother's and father's education were found to be significant association with anemia. The similar findings were resulted in study conducted[18,29]. The educated parents were more likely to discuss on measures on anemia prevention, eating of iron rich foods and adopting healthy practices. This would result adolescent comply with the WIFAS in school and therefore help prevent anemia since early pre pregnancy period.

The cutoff point recommended by WHO is 26 WIFAS tablets a year. But these findings show that increasing the program benchmarks could result in an additive increase in Hb levels with consumption greater than 26 tablets[26]. Although this was not statistically significant, the study discovered higher anemia odds in adolescents with a Hindu background. Additionally, there was no statistically significant correlation between ethnicity and anemia, indicating that neither religion nor ethnicity may be determining factors for anemia[24].

The mean age of menarche was 12.29(±0.92) years in line with study by Subramanian M et al. Additionally, a notable difference existed in between the school with first age at menarche, but no any statistical association between first age at menarche and anemia prevalence between girls attending WIFAS implemented and not implemented schools in this study whereas no significant difference between school and age at menarche with the prevalence of anemia in the study by Subramanian M.et al[43]. However, as it can be challenging for adolescent girls to consume enough iron to make up for the menstrual iron losses, menstrual blood loss can significantly contribute to iron depletion. This is crucial because nearly all the adolescent girls who participated in the study had experienced menarche, which can further affect their iron status.

WIFAS implemented in senior secondary schools of Delhi, the proportion of anemic girls dropped from 100% to 74% in the control group and from 93.3% to 38.6% in the intervention group. WIFAS combined with once-monthly health education was effective in lowering anemia prevalence in adolescent schoolgirls[36].The prevalence of anemia is low (21%)[7] in the study conducted in Etumanor panchayat where the WIFAS program have not been implemented which is similar to the present study among the adolescent girls. It indicates the provision of health education on advantages for cognitive and physical health, aids in increasing compliance with the consumption of WIFAS.

The compliance in the present study was 74.7% which was higher when compared to the study conducted in India (67%) and Ghana (66%) [21,30]. High compliance in this study could be due to the direct supervision by school health nurses in WIFAS implemented schools. In the present study, those who were in the direct supervision of teacher/supervisor were 78.7% compliant to WIFAS. Without supervision, there is a high chance of throwing the tablets away as suggested in the study by UNICEF[44]. In contrast, compliance to WIFAS was found low (45%) in the study among adolescents due to the fact that majority adolescents think that the iron tablet is not necessary[19]. Similarly, low compliance (26%) was found due to the reasons that parents tell them not to take[29]. In this study, the adolescent girls were found to be motivated to take the IFA tablet for the prevention of anemia and due to teacher advice. These results concur with a cross-sectional study conducted by Dubik et.al[29].

The study showed that the majority (84.7%) of the respondents who are adolescent girls have strong knowledge of anemia and Iron and Folic Acid. The study showed that more than half of the respondents (61.1%) have Hb levels greater than or equal to 12g/dl. With 38.9% of the respondents having Hb levels less than 12g/dl, and the prevalence according to WHO is “medium” [30]. This finding were almost similar to this study where about 83% of adolescent girls were non anemic and more than two third of the respondents had good knowledge on anemia, this might be the reason to intake iron rich foods and take protective measures to prevent from anemia.

It is always crucial to take WIFAS tablets only after food and under strict supervision. Adolescent girls' absenteeism and teachers' failure to give the girls the IFA tablet had an impact on compliance with the WIFAS. In this study, under the multivariate analysis,

there is enough evidence to support that the grade six to eight, extended family and the provision of school health nurse have greater impact on compliance to WIFAS. The main reason for non-compliant was absentees in the study. This finding were in line with the study conducted[29]. In the study, among the compliant the mean Hemoglobin level was 13.53 ((±1.31) and among the non-compliant the mean Hemoglobin level was 12.68 (±1.74). The findings were statistically significant.

The knowledge on WIFAS has the significant relationship with compliance in this study ($\chi 2$=4.5, OR= 1.9, CI 1.045-3.422, p value 0.034) as shown by similar study (OR = 2.29 (95% CI: 1.47, 3.57) $p < 0.01$)[29]. The adolescent girl's knowledge on anemia and WIFAS was found statistically significant with prevalence of anemia however only knowledge on WIFAS was significant with compliance, these findings reveal that receiving the WIFAS tablet or implementing the WIFAS program in the school doesn't assurance the understanding of anemia[34]. The WIFAS implemented school adolescent girls have comparatively good knowledge on anemia and WIFAS. When compared to girls who are knowledgeable about anemia and take into account its prevention and control mechanisms, the high prevalence of anemia among students who have never heard of or experienced it may be due to their lack of understanding of iron-rich foods. To this regard, school health nurse or teacher need to educate the adolescent on anemia and importance of iron rich foods.

The study conducted in Indonesia on the awareness on anemia and WIFAS among girls' adolescents found that the benefits of consuming WIFAS, according to the girls, included boosting stamina, adding iron, better digestion, overcoming premenstrual syndrome and adding red blood cells. The girls reported that they felt nauseous, slept, had black feces, and the aftertaste is weird after taking IFA. The girls claimed that they decided not to consume IFA during exams due to the negative effects[34]. However, in this study, WIFAS helped to increase the blood level was reported by majority of the respondents and stomach pain was major side effect felt by adolescents. The majority of the adolescent girls in this study reported that taking the IFA tablets had improved their menstrual cycles, focus, and academic performance. The knowledge on foods that inhibit iron absorption was lower. This finding could be as a result of the socio-cultural environment and the availability of foods that had an impact on the knowledge of girls and parents regarding foods and drinks that enhance and inhibit iron absorption.

The majority of the teenage girls who took the IFA tablet reported experiencing side effects. However, frequently reported side effects included headache, nausea, and vomiting as in other studies [7,6,19]. About 40% of the respondents faced the challenges where irregular supply of WIFAS was cited by 26.9% followed by lack of health education on WIFAS by 25.6%. Majority of the respondents (64.1%) cited that girls were given the WIFAS in order to prevent from anemia The irregular supply of water and lack of health education on WIFAS are the challenges faced by adolescent girls. These findings are very similar to the study conducted by Dubik et.al, 2019[29]. The successful implementation of the WIFAS program could be hindered by these side effects and challenges.

Regarding the prevalence of dietary diversity practice, of the total respondents (32.3%) reported adequate dietary practices. The adequacy of micronutrients is significantly correlated with dietary diversity. High dietary diversity is typically viewed as a beneficial aspect of a diet[40]. Similarly, adolescent girls with inadequate dietary diversity had a 2.1-fold (AOR = 2.1; (95% CI; 1.3, 3.5) higher risk of anemia than those with adequate dietary diversity[46]. In this study, participants with not adequate diet diversity were 13.80 times to be anemic (OR 13.80 at 95% CI 8.411-22.61) in compared to participants with adequate dietary diversity suggesting a significant relationship between adequate dietary diversity (at least five food group) and lower prevalence of anemia. Low dietary intake of food groups high in nutrients, such as eggs, milk, and meat, may be the cause.

Minimum dietary diversity was used to gauge dietary diversity practices, and adequate intake was defined as consuming at least five different food groups out of a possible ten in the previous 24 hours. Grains (white roots, tubers, and plantains) are a part of the composition, and pulses (beans, peas, and lentils), nuts and seeds, dairy, meat, poultry and fish, dark green leafy vegetables, other vitamin A-rich fruits and vegetables, other vegetables and fruits and other foods. Cereals were consumed universally, according to this study's analysis of 24-hour dietary recall data and food groups classified according to MDD-W, the mean dietary diversity score in the study was five[35].

Another predictor identified in the study was type of school; results showed that adolescents enrolled in WIFAS implemented schools were more likely than those enrolled in not implemented schools to have low dietary diversity scores[39]. This might

be linked due to the different socioeconomic status of family. This result was in line with research done in Jima Town[45]. More investigation seems to be required to carry on adolescent nutrition and to ascertain how dietary habits and food beliefs impact adolescent anemia.

Generally speaking, dietary diversity may be improved through health education on behavioral change in adolescents toward dietary diversity and to place more emphasis on their dietary condition. It is preferable if all kinds of school's care about the nutrition of their students. It was advised that the teenage girls cut back on their use of social media. A major factor in increasing food diversity using locally available and affordable food types may be to further improve maternal and women's education.

One of the eight essential, highly effective actions for enhancing adolescent nutrition identified by the WHO in the 2018 recommendations is weekly iron and folic acid supplementation (WIFAS). However, the Model Essential Medicines List (MEML) currently does not list WIFAS in the WHO-recommended formulation. In order to reduce anemia and prevent neural tube defects, WIFAS could be proposed to the MEML. With this inclusion, efforts to reduce anemia and neural tube defects globally could be accelerated in their implementation [47]. Lassi et al.'s recent review revealed that iron supplements could significantly raise adolescent hemoglobin concentration. To increase the amount and bioavailability of micronutrients in family diets, efforts should also be directed toward nutritional programs that encourage dietary diversity[48].

An effective national policy for the prevention and control of anemia, which includes providing weekly iron-folic acid to girls in and out of school, along with the school deworming program, may be the reason why the level of anemia among adolescents in the current study was lower than the national data. However, this study couldn't assess the significant role of deworming on anemia reduction.

CHAPTER VI: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The WIFAS program, which provides weekly supplements of iron and folic acid. significantly reduces anemia. Its supplementation administered at schools is effective in raising mean hemoglobin and lowering anemia prevalence in schoolgirls. The present study showed that WIFAS implemented schoolgirls had a lower prevalence of anemia (14%) than girls in not implemented schools (20.9%), suggesting that WIFAS played a role in the decline in anemia prevalence.

The main factors identified in the study were compliance, WIFAS knowledge, and dietary diversity which were statistically significant with the prevalence of anemia. Numerous studies have shown that taking iron and folic acid supplements can help to promote health before teenagers become parents and serve as iron storage which could be better utilized during pregnancy to prevent LBW babies in the future.

This study explicitly demonstrates how teacher supervision can improve compliance to the WIFAS program. In Nepal, adolescent anemia continues to be a serious public health issue. The present study area poses mild public health problems of adolescent anemia according to the WHO classification on prevalence of anemia.

5.2 Recommendation

The school is the best place to start upon the nutritional interventions. The WIFAS program's supplies, stocks, and records need to be periodically checked. It is necessary to increase awareness of the part that IFA plays in preventing iron deficiency anemia through information, education, and communication.

Informing and counselling adolescent girls about the advantages of a weekly iron and folic acid supplementation program. Behavioural Change Communication is necessary in addition to weekly iron and folic acid supplementation in order to encourage students to consume iron-rich diets, which will ultimately lead to a notable improvement in the students' iron status. School-based health education programs could be one of the ways to aware both students and teachers.

Further, school health nurse has to be recruited in every WIFAS implemented and non-WIFAS implemented schools to motivate and counsel adolescent girls on the benefits and consumption of WIFAS. The higher intake of WIFAS can improve overall public health so it is important to advocate about its importance in both school and out of school level. There is the provision for distribution of WIFAS in not implemented schools as well, but it has not been implemented in the study area. So, since there are anemic adolescent girls in not implemented schools, the local government has to act accordingly to supply the WIFAS in not implemented schools.

It is recommended to promote the WIFAS in a regular basis. However, the studies were mostly carried out in the impact of IFA supplementation on school-going adolescent girls but for adolescent boys it is not clear. Hence, it has to be explored more for determining the anemic status among adolescent boys as well.

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Annex I: IRC approval letter

त्रिभुवन विश्वविद्यालय
चिकित्सा शास्त्र अध्ययन संस्थान
डीनको कार्यालय, महाराजगंज
पो.ब.नं.: १५२४,काठमाडौं, नेपाल ।
फोन नं.: ४४१०९११, ४४१२०४०, ४४१३७२९, ४४१८१८७

Tribhuvan University
Institute of Medicine
Office of the Dean
Maharajgunj, P.O. Box: 1524
Kathmandu, Nepal
Ph.# 4110911, 4112040, 4113729, 4118187

पत्र संख्या / Ref.:- 265(6-11)E2

मिति / Date:- December 14, 2022

Institutional Review Committee

079/080

(IRC)

Ms.Anita Khanal
Student
Department of Public Health
MMC,IOM

Ref: **Approval of Research Proposal**

Dear Ms.Khanal,

Thank you for the submission of your research proposal, entitled **"Prevalence of anemia and its associated factors among adolescent girls on weekly iron folic acid supplementation (WIFAS) and non WIFAS group in school at Tokha Municipality, Kathmandu"**

I am pleased to inform you that after careful evaluation, the above-mentioned research proposal has been approved by Institutional Review Committee (IRC) of Institute of Medicine (IOM), Tribhuvan University on December 13, 2022.

As per our rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in title, objectives, problem statement, research questions or hypothesis, methodology, implementation procedures, data management and budget may be made so and implemented only after prior approval from IRC. Thus, it is compulsory to submit the details of such changes intended with justifications prior to actual change in the protocol.

Please note that you can start recruiting the research participants only after getting approval letter from the IRC. You are also requested to follow the ethical guidelines of IRC of IOM.

After completion of your study, you must submit a copy of final draft of your research to the Research Department.

If you have any further queries, please do not hesitate to contact us.

.....
Associate Prof. Dr. Manisha Chapagai
Member Secretary
Institutional Review Committee

Fax No. 4418186, E-mail: icmdean@iom.edu.np / website: www.iom.edu.np

Annex II: NHRC approval letter

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 2823

Date: 16th March, 2023

Ms. Anita Khanal
MPHN,
CDPH, TU

Subject: Approval letter for Grant

Dear Ms. Anita Khanal,

We would like to express our congratulations on the approval of the Postgraduate Research Grant FY 2079/080 offered by Nepal Health Research Council (NHRC). Our approved amount is Nrs 40,000 for the purpose of your research entitled **"Prevalence of anemia and effect of weekly iron and folic acid supplementation among school going adolescent girls at Tokha Municipality, Kathmandu"**. Please proceed further with the ethical approval process.

We hope that your research is a success and results in benefitting the entire society.

If any further discussion is needed in regard to this matter, please do not hesitate to contact Capacity Building Section.

.....

Dr. Pradeep Gyanwali
Member-Secretory (Executive Chief)
NHRC

Tel: +977 1 4254220, Ramshah Path, PO Box: 7626, Kathmandu, Nepal
Website: http://www.nhrc.gov.np, E-mail: nhrc@nhrc.gov.np

Annex III: Municipality approval letter (Health Section)

"ऐतिहासिक, सांस्कृतिक, पर्यटकीय समृद्ध टोखा नगर"

टोखा नगरपालिका

टोखा नगरपालिका

नगर कार्यपालिकाको कार्यालय

मैजुहिटी, काठमाडौं
बागमती प्रदेश, नेपाल

पत्र संख्या :- ०७९/८०
चलानी नं :- ६६४

मिति: २०७९/०७/२९

जो जस संग सम्बन्धित छ।

विषय : सहमति सम्बन्धमा।

प्रस्तुत विषयमा त्रिभुवन विश्वविद्यालय, चिकित्सा शास्त्र अध्ययन संस्थान, जनस्वास्थ्य केन्द्रीय विभागको च.नं. १७३।०७९।०८०, मिति २०७९।०७।२८ को पत्रानुसार यस नगरपालिका अन्तरगत "Prevalence of Anaemia and it's Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu शिर्षकमा अनुसन्धान गर्न लाग्नुभएका Master's in Public Health Nutrtion (MPHN) दोश्रो वर्षमा अध्ययनरत श्री अनिता खनाललाई यस नगरपालिका अन्तरगतका विद्यालयहरूमा रगतको जाँच गरी अध्ययन गर्नका लागि सहमति प्रदान गरिएकोले आवश्यक सहयोगका लागि अनुरोध गरिन्छ।

(रनलाल कुलाल)
जनस्वास्थ्य अधिकृत

सम्पर्क नं : ०१-४९८५०१३/०१-४९८८४०५ Email : hellotokha@gmail.com Website: www.tokhamun.gov.np

Annex IV: Municipality approval letter (Education Section)

"ऐतिहासिक, सांस्कृतिक, पर्यटकीय समृद्ध टोखा नगर"

टोखा नगरपालिका

नगर कार्यपालिकाको कार्यालय

पत्र संख्या :- ०७९/८०

चलानी नं :- ८९५

मैजुहिटी, काठमाडौं
बागमती प्रदेश, नेपाल

मिति २०७९।०७।२९

श्री जो जससँग सम्बन्धित छ।

विषयः स्वीकृति सम्बन्धमा।

प्रस्तुत विषयमा त्रिभुवन विश्वविद्यालय, चिकित्सा शास्त्र अध्ययन संस्थान, जनस्वास्थ्य केन्द्रीय विभाग महाराजगञ्ज, काठमाडौंको च.नं. १७३ मिति २०७९।०७।२८ गतेको प्राप्त पत्रानुसार, जनस्वास्थ्य केन्द्रीय विभाग, महाराजगञ्जमा जनस्वास्थ्य विषयमा स्नातकोत्तर तह (Master in Public health Nutrition) दोस्रो वर्षमा अध्ययनरत (रोल नं.३१) श्री अनिता खनाललाई विश्वविद्यालयको पाठ्यक्रम अनुसार 'prevalence of Anemia and its associated factors among Adolescent Girls on Weekly Iron Folic Acid supplementation (WIFAS) and non WIFAS Group in schools at Tokha municipality, kathmandu' शीर्षकमा अनुसन्धान गर्न यस टोखा नगरपालिका अन्तर्गतका ८ वटा सामुदायिक र छनौटमा परेका ८ वटा संस्थागत विद्यालयहरुमा अध्ययनरत कक्षा ६ देखि १० सम्मका १० देखि १९ वर्षका किशोरीहरुमा data collection कार्य गर्न स्वीकृति प्रदान गरिएको व्यहोरा अनुरोध छ।

२०७९।०७।२९

शंकरराज पाठक

प्रमुख प्रशासकीय अधिकृत

सम्पर्क नं : ०१-४९८५०१३/०१-४९८८४०५ Email : hellotokha@gmail.com Website: www.tokhamun.gov.np

Annex V: Written information sheet and informed consent of principal

Dear Principal Sir/Madam,

Namaste!

My name is Anita Khanal. I am studying Master in Public Health Nutrition at Centre Department of Public Health, Institute of Medicine, Kathmandu. I am doing my research work entitled "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu., Kathmandu" which is a requirement for the partial fulfillment of MPHN degree. The main objective of my research is to assess the difference in prevalence of anemia among WIFAS implemented school-going adolescent girls on WIFAS as compared to not implemented school girls not on WIFAS. Your students are invited to be part of this study and I would, therefore, like to seek your consent. Participation is completely voluntary and your students may withdraw at any time.

This research has been approved by the Ethics Committee in IOM and aims to assess the prevalence of anemia among adolescent girls from grade 6-10. The concentration of hemoglobin in the blood of adolescent was measured using the HemoCue system. A sterile lancet was used to prick blood from finger and immediately put on microcuvette so as to draw blood by capillary action. I would like to thank you for taking the time to look at the questionnaires and allowing your students to take part.

Consent:

I declare that I have read and understood the above information sheet. I hereby give my permission for my students to participate in this research project.

School Name: …….

Principal Name: ……..

Signature: …… Date: …….

AnnexVI: Written information sheet and Informed consent form for parents (Nepali)

सुसुचित लिखित मञ्जुरीनामा

आरदणीय अविभावक ज्यू,

नमस्कार,

मेरो नाम अनिता खनाल हो। म जनस्वास्थ्य केन्द्रिय बिभाग , इन्स्टिच्युट अफ मेडिसिन , काठमाडौंमा मास्टर इन पब्लिक हेल्थ न्यूट्रिसन पढ्दै छु । **टोखा नगरपालिका, काठमाडौंका विद्यालयहरूमा साप्ताहिक आइरन फोलिक एसिड पूरक (WIFAS) र गैर WIFAS समूहका किशोरीहरूमा रक्तअल्पताको भार र यससँग सम्बन्धित कारकहरू** शीर्षकमा मेरो अनुसन्धान कार्य गरिरहेको छु। मेरो अनुसन्धानको मुख्य उद्देश्य सरकारी विद्यालय जाने किशोरीहरू र निजी विद्यालयका किशोरीहरू बीच एनिमियाको व्याप्तिमा भिन्नताको मूल्याङ्कन गर्नु हो । तपाईको छोरीको विद्यालय यस सर्वेक्षणको एक हिस्सा हुनको लागि छनोट गरिएको छ । तपाईको छोरीलाई अध्ययनको लागि उत्तरदाताको रूपमा चयन गरिएको छ । म तपाईको छोरीलाई सामाजिक-जनसांख्यिक, रक्तअल्पता सम्बन्धी ज्ञान, साप्ताहिक आइरन र फोलिक एसिड पूरकमा ज्ञान, अनुपालन र आहार विविधता सम्बन्धी प्रश्नहरूको सूची समावेश गर्ने प्रश्नावली उपलब्ध गराउनेछु । प्रश्नावली भर्नको लागि समय लगभग ३० मिनेट छ ।

प्रत्रिया

तपाइको छोरि यस सर्वेक्षणको एक हिस्सा बन्न चयन गरिएको छ । म उनीलाई सामाजिक जनसांख्यिक, रक्तअल्पता सम्बन्धी ज्ञान, साप्ताहिक आइरन फोलिक एसिड पूरकता, अनुपालन र आहार विविधता सम्बन्धी ज्ञान सम्बन्धी प्रश्नहरूको सूची समावेश गर्ने प्रश्नावली प्रदान गर्नेछु । किशोरावस्थाको रगतमा हेमोग्लोबिनको एकाग्रता हेमोक्यू प्रणाली प्रयोग गरी मापन गरिनेछ । केशिका कार्यद्वारा रगत तान्नका लागि औंलाबाट रगत चुच्न र तुरुन्तै माइक्रोक्युभेटमा राख्नको लागि एक बाँझ ल्यान्सेट प्रयोग गरिनेछ। रगतमा हेमोग्लोबिनको मात्रा मेसिनमा एक मिनेट भित्र विस्थापित गरिनेछ र प्रश्नावलीमा रेकर्ड गरिनेछ। यो सबै प्रक्रिया लगभग ३० मिनेट लाग्नेछ ।

उत्तरदाता अधिकार

यस अनुसन्धानमा तपाईंको छोरिको सहभागिता स्वैच्छिक हो। अन्तर्वार्ताको क्रममा तपाईंकी छोरि इच्छुक छैन भने उनको सहभागिता फिर्ता लिन सक्नुहुन्छ ।

लाभ / जोखिम

यस अध्ययनमा तपाईको छोरिलाई कुनै आर्थिक लाभ छैन तर हेमोग्लोबिन स्तरको बारेमा जानकारी प्राप्त गर्दा तपाईको छोरि प्रत्यक्ष रूपमा लाभान्वित हुनुहुन्छ । यस अध्ययनमा भाग लिन इच्छुक हुनुहुन्छ भने तपाईंले छोरिले रगतको नमूना लिने क्रममा हल्का दुखाइ सहनुपर्छ।

गोपनीयता

सबै व्यक्तिगत जानकारीको लागि गोपनीयता कायम गरिनेछ । व्यक्तिगत जानकारी सुरक्षित गर्न कम्प्युटर कोडिङ गरिनेछ। व्यक्तिगत विवरण जर्नल, रिपोर्ट आदिमा प्रकाशित गरिने छैन ।

अध्ययन बारे थप जानकारी

तपाईको छोरीको सहभागीता यस अध्ययनको लागी महत्वपूर्ण छ । के तपाई यो अध्ययनमा छोरीलाई सहभागी गराउन चाहनुहुन्छ ?

क) चाहन्छु

ख) चाहन्न

सहमति

यस अध्ययनमा भाग लिन पूर्णतया स्वैच्छिक हो भनेर मैले पूर्ण रूपमा बुझेको छु। म यस अध्ययनमा मेरो छोरिको सहभागिता कुनै पनि समय फिर्ता लिन सक्छु। म यस अध्ययनको उद्देश्य, प्रक्रिया, खतरा र फाइदाहरू बारे पूर्ण रूपमा सचेत छु । मैले बुझेको छु; मेरो छोरिबाट लिइएको जानकारी केवल अध्ययन उद्देश्यको लागि हो । मैले अध्ययनको क्रममा कुनै पनि प्रश्नहरू स्पष्ट गर्न प्रश्न सोध्ने अवसर पाएको छु । म मेरो छोरिको जानकारी यस अध्ययनमा मात्र प्रयोग गर्न मेरो स्वीकृति दिन इच्छुक छु । मेरो छोरिलाई यस अध्ययनमा भाग लिन अनुमति दिनु मेरो व्यक्तिगत निर्णय हो। मैले बुझेको छु कि अध्ययनमा सहभागिताले मलाई र मेरो छोरिलाई कुनै हानि हुने छैन ।

अभिभावकको नाम: ..... विद्यार्थीसंगको सम्बन्ध: .....

दस्तखत: .....

विद्यार्थीको रोल नं..... कक्षा: .....

Annex VII: Written Information sheet and consent form for student (Nepali)

सुसुचित लिखित मञ्जुरीनामा

नमस्कार,

मेरो नाम अनिता खनाल हो । म जनस्वास्थ्य केन्द्रिय विभाग , इन्स्टिच्युट अफ मेडिसिन ,काठमाडौंमा मास्टर इन पब्लिक हेल्थ न्यूट्रिसन पढ्दै छु । **टोखा नगरपालिका, काठमाडौंका विद्यालयहरूमा साप्ताहिक आइरन फोलिक एसिड पूरक (WIFAS) र गैर WIFAS समूहका किशोरीहरूमा रक्तअल्पताको भार र यससँग सम्बन्धित कारकहरू** शीर्षकमा मेरो अनुसन्धान कार्य गरिरहेको छु । मेरो अनुसन्धानको मुख्य उद्देश्य सरकारी विद्यालय जाने किशोरीहरू र निजी विद्यालयका किशोरीहरूबीच एनिमियाको व्याप्तिमा भिन्नताको मूल्याङ्कन गर्नु हो ।

प्रक्रिया

तपाईलाई यस सर्वेक्षणको एक हिस्सा बन्न चयन गरिएको छ । म तपाईलाई सामाजिक जनसांख्यिकी, रक्तअल्पता सम्बन्धी ज्ञान, साप्ताहिक आइरन फोलिक एसिड पूरकता, अनुपालन र आहार विविधता सम्बन्धी ज्ञान सम्बन्धी प्रश्नहरूको सूची समावेश गर्ने प्रश्नावली प्रदान गर्नेछु । किशोरावस्थाको रगतमा हेमोग्लोबिनको एकाग्रता हेमोक्यू प्रणाली प्रयोग गरी मापन गरिनेछ । केशिका कार्यद्वारा रगत तान्नका लागि औंलाबाट रगत चुच्न र तुरुन्तै माइक्रोक्युभेटमा राख्नको लागि एक बाँझ ल्यान्सेट प्रयोग गरिनेछ । रगतमा हेमोग्लोबिनको मात्रा मेसिनमा एक मिनेट भित्र विस्थापित गरिनेछ र प्रश्नावलीमा रेकर्ड गरिनेछ । यो सबै प्रक्रिया लगभग ३० मिनेट लाग्नेछ ।

उत्तरदाता अधिकार

यस अनुसन्धानमा तपाईंको सहभागिता स्वैच्छिक हो। यदि तपाईं जारी राख्न इच्छुक हुनुहुन्न भने प्रश्नावली भर्ने क्रममा तपाईंले सहभागिता फिर्ता लिन सक्नुहुन्छ।

लाभ / जोखिम

यस अध्ययनमा तपाईलाई कुनै आर्थिक लाभ छैन तर तपाईको हेमोग्लोबिन स्तरको बारेमा जानकारी प्राप्त गर्दा तपाई प्रत्यक्ष रूपमा लाभान्वित हुनुहुन्छ। यदि तपाईं यस अध्ययनमा भाग लिन इच्छुक हुनुहुन्छ भने तपाईंले रगतको नमूना लिने क्रममा हल्का दुखाइ सहनुपर्छ।

गोपनीयता

सबै व्यक्तिगत जानकारीको लागि गोपनीयता कायम गरिनेछ। व्यक्तिगत जानकारी सुरक्षित गर्न कम्प्युटर कोडिङ गरिनेछ। व्यक्तिगत विवरण जर्नल, रिपोर्ट आदिमा प्रकाशित गरिने छैन ।

अध्ययन बारे थप जानकारी

यदि तपाईंले कुनै प्रश्न बुझ्नुभएको छैन भने, तपाईंले प्रश्नावली भर्ने बिचमा मलाई सोध्न सक्नुहुन्छ। यदि तपाईंसँग यस अध्ययनको बारेमा कुनै प्रश्न छ भने, तपाईं मलाई अन्त्यमा सोध्न सक्नुहुन्छ वा कुनै पनि समयमा मलाई सम्पर्क गर्न सक्नुहुन्छ। तपाईको सहभागीता यस अध्ययनको लागी महत्वपूर्ण छ । यहाँको सहयोग लागि अत्यन्त आभारी रहनेछु ।

अनिता खनाल, बिधार्थी
फोन नं.९८४९४८५६२७
के तपाई यो अध्ययनमा सहभागी हुन चाहनुहुन्छ ?
क) चाहन्छु
ख) चाहन्न

सहमति

यस अध्ययनमा भाग लिन पूर्णतया स्वैच्छिक हो भनेर मैले पूर्ण रूपमा बुझेकी छु । म कुनै पनि समयमा कुनै पनि शुल्क बिना यस अध्ययनबाट मेरो सहभागिता फिर्ता लिन सक्छु । म यस अध्ययनको उद्देश्य, प्रक्रिया, खतरा र फाइदाहरू बारे पूर्ण रूपमा सचेत छु । मैले बुझेको छु; मबाट लिइएको जानकारी केवल अध्ययन उद्देश्यको लागि हो । मैले अध्ययनको क्रममा कुनै पनि प्रश्नहरू स्पष्ट गर्न प्रश्न सोध्ने अवसर पाएको छु । यस अध्ययनमा भाग लिने मेरो व्यक्तिगत निर्णय हो ।

दस्तखत : .....
स्कुलको नाम : .....
रोल नम्बर : .....

Annex VIII: Self- administered questionnaire in English

Tribhuvan University
Institute of Medicine
Central Department of Public Health
Master in Public Health nutrition 2021

Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) implemented and not implemented Schools at Tokha Municipality, Kathmandu.

Name of the school…….....
Type of school (WIFAS implemented/not implemented) ……..……..……
Address of the school……..……..……Form No.…..……
Date of interview (DD/MM/YY) ……
Please Tick (√) the options to answer the question.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS			
S.N	Questions	Options	Code
1.	Age in years (completed age)	☐	
2.	Grade	☐	
3	What is your first age of mensuration?	☐	
4.	Marital status of respondents	Never married Married/living together Divorced/Separated Widowed	1 2 3 4
5.	Ethnicity	Bhramin/Chhetri Dalit Janajati Madhesi Muslim Others (specify)	1 2 3 4 5 98
6.	Religion	Hindu Buddhist Muslim Kirat Christian Others (specify)	1 2 3 4 5 98
7.	Type of Family	Nuclear Joint/Extended	1 2
8.	Educational status of Mother	**No education** **Basic education (1-8)** lower basic education (1-5) upper basic education (6-8) **Secondary (9-12)** lower secondary (9-10) upper secondary (11-12) **More than secondary (13 and above)**	1 2 3 4

9.	Educational status of father	**No education** **Basic education (1-8)** lower basic education (1-5) upper basic education (6-8) **Secondary (9-12)** lower secondary (9-10) upper secondary (11-12) **More than secondary (13 and above)**	1 2 3 4
10.	Father's occupation	Agriculture Housework Service business foreign Employment Daily wages Other (specify)	1 2 3 4 5 6 98
11.	Mother's occupation	Agriculture Housework Service Business Foreign Employment Daily wages Other (specify)	1 2 3 4 5 6 98

SECTION B: Knowledge on Anemia and Weekly iron folic acid supplementation (WIFAS)
Knowledge on Anemia

12.	What does it mean to have anemia?	Not having enough blood Having more blood Running diarrhea Don't know	1 2 3 89
13.	Do you know what causes anemia? **Tick all that apply**	Iron and folic acid deficiency Bacteria Vitamin A and B12 Deficiency Parasitic infection having too much sugar Blood loss due to menstruation Don't know	1 2 3 4 5 6 89
14.	What are the symptoms of anemia? **Tick all that apply**	Fatigue Bleeding Fast breathing Cold Paleness of skin Chest pain Fainting Dizziness Don't know	1 2 3 4 5 6 7 8 89
15.	How can anemia be prevented/treated? **Tick all that apply**	Taking recommended iron and folic acid supplement Eat diet rich in iron and folic acid Taking Vitamin A and B12 supplements Taking in a lot of coffee, tea and sugar prevent malaria by sleeping under mosquito nets Don't know	1 2 3 4 5 89

16.	What are some of the consequences of anemia? **Tick all that apply**	Diarrhoea Reduced attention span Poor learning performance Speedy recovery from diseases Low resistance to infection Decreased physical activity Don't know	1 2 3 4 5 6 89
	Knowledge on Weekly iron folic acid supplementation (WIFAS)		
17.	Do you know about weekly iron folic acid supplement?	Yes No	1 2
18	Why to give the iron and folic acid tablet every week?	To prevent anemia in adolescent girls To stop diarrhea in girls Don't know	1 2 3
19	Why do you think girls are given the iron and folic tablets rather than boys? **Tick all that apply**	Girls are at risk of anemia Boys are healthier than girls Girls lose blood every month Don't know	1 2 3 4
20	What are benefits of WIFAS?	Improve concentration and performance in school Increased blood volume Prevent malaria It prevent iron and folic acid deficiency Improve our general health Prevent diarrhea Don't know	1 2 3 4 5 6 89
21	What are some of the food items that inhibit/decrease iron absorption? **Tick all that apply**	Coffee Vegetables Tea Milk and milk products Fruits Don't know	1 2 3 4 5 89
22	Which of the following are side effects of taking iron and folic acid tablet? **Tick all that apply**	Stomach ache Vomiting Black stool Constipation diarrhoea Severe pains Don't know	1 2 3 4 5 89

	SECTION C: Compliance to Weekly iron folic acid supplementation (For WIFAS implemented schools only)		
23	Are you currently consuming iron and folic acid tablets in the school?	Yes No	1 2
24	If yes, what reasons will you give for you continuing to consume the iron and folic acid tablet?	Advice from teacher Friends are taking it It prevents anemia Because it is free	1 2 3 4
25	If not, why are you not taking the tablet?	I am healthy My parents ask me not to take the tablet	1 2 3

		Fear of side effects Others(specify)	98
26	How many tablets of the iron and folic acid have you consumed for the past 4 weeks in the school?	0-1 tablet 2-3 tablets 4 tablets	1 2 3
27	Do you always take the IFA tablet in the presence of supervisor or a teacher?	Yes No	1 2
28	Have you ever miss taking the iron and folic acid tablet in school?	Yes No	1 2
29	If yes, what was the reason for missing?	I was absent I was not given IFA tablet Side effects Bad taste of IFA tablet Others (specify)	1 2 3 4 98
30	Which of the following do you experience when you take folic acid tablet? **Tick all that apply**	Stomach ache Nausea Vomiting Diarrhea Black stool Headache No side effects	1 2 3 4 5 6 89
31	What are the school challenges you face during taking WIFAS at school?	Lack of water in school to drink Irregular supply of tablet Lack of proper counselling at school Lack of health education on WIFAS No any challenges	1 2 3 4 89

SECTION D: DIETARY DIVERSITY QUESTIONNAIRE			
Now I'd like to ask you to describe everything that you ate or drank yesterday during the day or night, whether you ate it at home or anywhere else. Please include all foods and drinks, any snacks or small meals.			
D001	Do you have anything to eat or drink when you woke up in the morning?	Yes ……..…….1 No……...2	If No go to Q.H003
D002	If yes, what? Anything else?	……	
D003	Did you have anything to eat or drink in the yesterday morning?	Yes ……..…….1 No……...2	If No go to Q.H005
D004	If yes, what? Anything else?	……...	
D005	Did you have anything to eat or drink during the yesterday afternoon?	Yes ……..…….1 No……...2	If No go to Q.H007
D006	If yes, what? Anything else?		
D007	Did you have anything to eat in the yesterday evening?	Yes ……..…….1 No……...2	If No go to Q.H009
D008	If yes, what? Anything else?		

D009	Did you have anything else to eat or drink in the yesterday night before going to bed?	Yes ……..…….1 No……...2	If No go to section E
D010	If yes, what? Anything else?		

Section E

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning

Sn	Food Groups	Food categories	Food items	consumed within last 24 hours
E001	Grains, white roots and tubers and plantains	Foods made from grains	Maize, rice, barley, millet, sorghum, wheat	Yes …1 No…..2
		white roots and tubers and plantains	Potatoes, turnip	Yes….1 No.....2
E002	Pulses (beans, peas and lentils)	Pulses (beans, peas and lentils)	Dal, pulses, pea, beans, soyabean, chana Dal	Yes …1 No…..2
E003	Nuts and seeds	Nuts and seeds	Almond, chestnut, walnut, peanuts	Yes….1 No…..2
E004	Dairy	Milk and milk products	Milk, yoghurt, cheese	Yes …1 No…..2
E005	Meat, poultry and fish	Organ Meat	Liver, heart, blood products, kidney, gizzard	Yes …1 No…..2
		Meat and poultry	Beef, goat, lamb, mutton, pork, buffalo, rabbit, chicken, duck	Yes….1 No…..2
		Fish	Fish	Yes …1 No…..2
E006	Eggs	Eggs	Chicken eggs, duck eggs	Yes …1 No…..2
E007	Dark green leafy vegetables	Dark green leafy vegetables	Spinach, pumpkin leaves, amaranths, mustard leaves, broccoli, carrot leaves	Yes ...1 No….2
E008	Other Vit. A rich fruits and vegetables	Vitamin A-rich vegetables, roots and tubers	Carrot, pumpkin, sweet potato	Yes ...1 No….2
		Vitamin A-rich fruits	Mango, papaya	Yes …1 No…..2
E009	Other vegetables	Other vegetables	Cabbage, cauliflower, corn, tomato, bamboo shouts, mushroom, cucumbers	Yes ....1 No…..2
E010	Other fruits	Other fruits	Apple, banana, grapes, guava, amla, lemon, lime, orange, pear, pineapple, strawberry, watermelon	Yes ...1 No….2
SECTION F: Biological test				
Haemoglobin level (g/dl)			**.....**	

Annex IX: Self- administered questionnaire in Nepali

त्रिभुवन विश्वविद्यालय
चिकित्सा संस्थान
केन्द्रीय जनस्वास्थ्य विभाग
स्नातोकोतर जन स्वास्थ्य पोषण

टोखा नगरपालिका, काठमाडौंका विद्यालयहरूमा साप्ताहिक आइरन फोलिक एसिड पूरक (WIFAS) र गैर WIFAS समूहका किशोरीहरूमा रक्तअल्पताको भार र यससँग सम्बन्धित कारकहरू

विद्यालयको नामं.....
विद्यालयको प्रकार (सरकारी/निजी).....
विद्यालयको ठेगाना..... फारम नं.....
अन्तर्वार्ताको मिति.....

खण्ड क: सामाजिक-सांख्यिक विशेषताहरू			
क्र.सं	**प्रश्न**	**विकल्प**	**कोड**
१.	उमेर वर्षमा (पूर्ण उमेर)	☐	
२.	क्षा	☐	
३.	तपाइको पहिलो महिनावारीको उमेर कति हो ? (महिनावारी भएकाहरुलाई मात्र)	☐	
४.	वैवाहिक स्थिति	अविवाहित विवाहित/सँगै बस्ने सम्बन्धविच्छेद/विछोड भएको बिधवा	१ २ ३ ४
५.	जात/ जाती	ब्राह्मण/क्षेत्री दलित जनजाति मधेसी मुस्लिम अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ४ ५ ९८
६.	धर्म	हिन्दू बौद्ध मुस्लिम किरात क्रिस्चियन अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ४ ५ ९८
७.	परिवारको प्रकार	सानो संयुक्त / विस्तारित	१ २
८.	आमाको शैक्षिक अवस्था	शिक्षा छैन **आधारभूत शिक्षा (१-८)** निम्न आधारभूत शिक्षा (१-५) उच्च आधारभूत शिक्षा (६-८) **माध्यमिक (९-१२)** निम्न माध्यमिक (**९-१०**) उच्च माध्यमिक (११-१२) **माध्यमिक भन्दा बढी (१३ र माथि)**	१ २ ३ ४ ५ ६

९.	बुबाको शैक्षिक अवस्था	शिक्षा छैन **आधारभूत शिक्षा (१-८)** निम्न आधारभूत शिक्षा (१-५) उच्च आधारभूत शिक्षा (६-८) **माध्यमिक (९-१२)** निम्न माध्यमिक (ढ-ज्ञण) उच्च माध्यमिक (११-१२) **माध्यमिक भन्दा बढी (१३ र माथि)**	१ २ ३ ४ ५ ६
१०.	बुबाको पेशा	कृषि घरको काम सरकारी सेवा निजी व्यवसाय वैदेशिक रोजगारी दैनिक ज्याला अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ४ ५ ६ ९८
११.	आमाको पेशा	कृषि घरको काम सरकारी सेवा निजी व्यवसाय वैदेशिक रोजगारी दैनिक ज्याला अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ४ ५ ६ ९८

खण्ड B : रक्तअल्पता (Anemia) र साप्ताहिक आइरन फोलिक एसिड पूरक (WIFAS) मा ज्ञान

रक्तअल्पता बारे ज्ञान

१२.	रक्तअल्पता हुनु भनेको के हो?	पर्याप्त रगत नहुनु रगत बढी हुनु पखाला धेरै हुनु थाहा छैन	१ २ ३ ८९
१३.	के तपाईलाई थाहा छ के कारणले रक्तअल्पता हुन्छ ? (लागू हुने सबैमा टिक गर्नुहोस)	फलाम र फोलिक एसिडको कमी ब्याक्टेरिया भिटामिन ए र बी 12 को कमी परजीवी संक्रमण धेरै चिनी हुनु महिनावारीको कारण रगतको कमी थाहा छैन	१ २ ३ ४ ५ ६ ८९
१४.	रक्तअल्पताका लक्षणहरू के के हुन? (लागू हुने सबैमा टिक गर्नुहोस्)	थकान रक्तश्राव छिटो सास फेर्नु छालाको पहेंलोपन छातीको दुखाइ चिसो बेहोस हुनु चक्कर आउनु थाहा छैन	१ २ ३ ४ ५ ६ ७ ८ ८९

१५.	रक्तअल्पतालाई कसरी रोक्न/उपचार गर्न सकिन्छ? (लागू हुने सबैमा टिक गर्नुहोस्)	सिफारिस गरिएको फलाम र फोलिक एसिड पूरक लिनुहोस् आइरन र फोलिक एसिड युक्त आहार खानुहोस् भिटामिन A र B12 पूरक खानाहरू लिनुहोस् कफी, चिया र चिनी धेरै मात्रामा लिनुहोस् लामखुट्टको जालीमुनि सुत्दा मलेरियाबाट बच्न सकिन्छ थाहा छैन	१ २ ३ ४ ५ ६ ८९
१६.	रक्तअल्पताका केही परिणामहरू के हुन? (लागू हुने सबैमा टिक गर्नुहोस्)	पखाला कम ध्यान अवधि खराब सिकाइ प्रदर्शन रोगहरु बाट छिटो रिकभरी संक्रमणको कम प्रतिरोध क्षमता शारीरिक गतिविधि घट्नु थाहा छैन	१ २ ३ ४ ५ ६ ८९
साप्ताहिक फलाम फोलिक एसिड पूरक (WIFAS) मा ज्ञान			
१७.	के तपाईलाई साप्ताहिक आइरन फोलिक एसिड सप्लिमेन्ट बारे थाहा छ?	छ छैन	१ २
१८.	आइरन र फोलिक एसिडको ट्याब्लेट हरेक हप्ता किन दिने गरिन्छ ?	किशोरीहरुमा रक्तअल्पता रोक्न किशोरीहरुमा पखाला रोक्न थाहा छैन	१ २ ८९
१९.	केटाहरूलाई भन्दा केटीहरूलाई फलाम र फोलिक ट्याब्लेट किन दिइन्छ जस्तो लाग्छ? (लागू हुने सबैमा टिक गर्नुहोस्)	केटीहरू एनिमियाको जोखिममा छन् केटाहरु केटीहरु भन्दा स्वस्थ छन् केटीहरु हरेक महिना महिनावारी हुन्छन् थाहा छैन	१ २ ३ ८९
२०.	WIFAS खानुका फाईदाहरु के के हुन्? (लागू हुने सबैमा टिक गर्नुहोस्)	विद्यालयमा एकाग्रतामा सुधार ल्याउछ् रगतको मात्रा बढ्छ मलेरिया रोकथाम गर्छ यसले आइरन र फोलिक एसिडको कमीलाई रोक्छ हाम्रो सामान्य स्वास्थ्य सुधार गर्छ पखाला रोक्छ थाहा छैन	१ २ ३ ४ ५ ६ ८९
२१.	फलामको शोषणलाई रोक्न/घटाउने केही खाद्य वस्तुहरू के के हुन्? (लागू हुने सबैमा टिक गर्नुहोस्)	कफी तरकारी चिया दूध र दुग्धजन्य पदार्थ फलफूल थाहा छैन	१ २ ३ ४ ५ ८९
२२.	आइरन र फोलिक एसिड ट्याब्लेट खाँदा निम्न मध्ये कुन साइड इफेक्टहरू हुन्छन? (लागू हुने सबैमा टिक गर्नुहोस्)	पेट दुख्ने उल्टी कालो दिसा कब्जियत पखाला कडा दुखाइ	१ २ ३ ४ ५

		थाहा छैन	६ ८९

खण्ड C : साप्ताहिक फलाम फोलिक एसिड पूरकको अनुपालन (सरकारी विद्यालयहरूको लागि मात्र)

२३.	के तपाइँ हाल विद्यालयमा आइरन र फोलिक एसिड ट्याब्लेटहरू खादै हुनुहुन्छ?	छ छैन	१ २
२४.	यदि छ भने, तपाईले फलाम र फोलिक एसिडको ट्याब्लेट उपभोग गर्नका कारणहरू के के हुन्?	शिक्षकबाट सल्लाह किनभने साथीहरूले लिइरहको छन् यसले रक्तअल्पताबाट बचाउँछ किनभने यो निः शुल्क छ	१ २ ३ ४
२५.	यदि छैन भने, तपाईंले ट्याब्लेट किन लिनु भएको छैन?	म स्वस्थ छु मेरा आमाबाबुले मलाई ट्याब्लेट नलिन आग्रह गर्छन् साइड इफेक्टको डर अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ९८
२६.	तपाईंले विद्यालयमा विगत ४ हप्तादेखि आइरन र फोलिक एसिडका कतिवटा ट्याब्लेट खानुभएको छ ?	०-१ ट्याब्लेट २-३ ट्याब्लेट ४ ट्याब्लेट	१ २ ३
२७.	के तपाई सधैं WIFAS ट्याब्लेट शिक्षकको वा सुपरिवेक्षणको उपस्थिति लिनुहुन्छ?	हो होइन	१ २
२८.	के तपाईंले कहिल्यै स्कुलमा आइरन र फोलिक एसिड ट्याब्लेट खान छुटाउनु भएको छ?	छ छैन	१ २
२९.	यदि छे भने, छुटाउनुको कारण के थियो?	म अनुपस्थित थिएँ मलाई WIFAS ट्याब्लेट दिइएको थिएन साइड इफेक्ट WIFAS ट्याब्लेटको खराब स्वाद अन्य (प्रस्ट पार्नुहोस्)	१ २ ३ ४ ९८
३०.	तपाईंले आइरन र फोलिक एसिड ट्याब्लेट खाँदा तलका मध्ये कुन अनुभव गर्नु भयो ? (लागू हुने सबैमा टिक गर्नुहोस्)	पेट दुख्ने वाकवाकी उल्टी पखाला कालो दिसा टाउको दुख्ने कुनै साइड इफेक्ट छैन	१ २ ३ ४ ५ ६ ८९
३१.	विद्यालयमा WIFAS लिँदा तपाईंले सामना गर्नभएको विद्यालयका चुनौतीहरू के हुन? (लागू हुने सबैमा टिक गर्नुहोस्)	विद्यालयमा पिउने पानीको अभाव टयाब्लेटको अनियमितता विद्यालयमा उचित परामर्शको अभाव WIFAS मा स्वास्थ्य शिक्षाको अभाव कुनै चुनौती छैन	१ २ ३ ४ ८९

खण्ड D : खाद्य विविधता सम्बन्धी प्रश्नावली

अब म तपाईलाई दिन वा रातमा तपाईले खानुभएको वा पिउनुभएको सबै कुराको वर्णन गर्न सोध्न चाहन्छु, चाहे तपाईले घरमा खानुभएको होस् वा अन्यत्र। कृपया सबै खानेकुरा र पेय पदार्थहरू, कुनै पनि खाजा वा साना खानाहरू समावेश गर्नुहोस्।

D001	तपाई विहान उठे लगतै खानु वा पिउनु भएको थियो?	थियो.....१ थिएन.....२	यदि थिएन उत्तर आएमा प्र.न. D003 मा जानुहोस्
D002	यदि थियो भने के के खानु वा पिउनु भएको थियो?	.....	विस्तृत रुपममा लेख्नुहोस
D003	तपाई हिजो विहान खाजाको रुपमा केही खाना वा तरल खानु भएको थियो?	थियो.....१ थिएन.....२	यदि थिएन उत्तर आएमा प्र.न. D005 मा जानुहोस्
D004	यदि थियो भने के के थियो ? (विस्तृतमा लेख्नुहोस)	.....	
D005	तपाई हिजो मध्यान्ह वा दिउसो खानाको रुपमा केही खाना वा तरल खानु भएको थियो?	थियो.....१ थिएन.....२	यदि थिएन उत्तर आएमा प्र.न. D007 मा जानुहोस्
D006	यदि थियो भने के के थियो ? (विस्तृतमा लेख्नुहोस)	.....	
D007	तपाई हिजो साँझ पख खाजाको रुपमा केही खाना वा तरल खानु भएको थियो?	थियो.....१ थिएन.....२	यदि थिएन उत्तर आएमा प्र.न. D009 मा जानुहोस्
D008	यदि थियो भने के के थियो ? (विस्तृतमा लेख्नुहोस)	.....	
D009	तपाई हिजो राति वा सुत्नु अघाडी खाना वा खाजाको रुपमा केही खाना वा तरल खानु भएको थियो?	थियो.....१ थिएन.....२	यदि थिएन उत्तर आएमा यो भाग अन्त गर्नुहोस्
D010	यदि थियो भने के के थियो ? (विस्तृतमा लेख्नुहोस)	.....	

Section E

कृपया तपाईंले हिजो दिन र रातमा खानुभएको खाना (खाना र खाजा) वर्णन गर्नुहोस्, चाहे घरमा होस् वा घर बाहिर। विहान खाएको पहिलो खानाबाट सुरु गर्नुहोस्

सि.नं.	खाद्य समुहे	खाद्य किसिम	खाद्य प्रकार (गोलोलगाउने)	पछिल्लो २४ घण्टा भित्र खाएको
E001	अनाजबाट बनेका खाद्य पदाथ	अनाजबाट बनेका खाद्य पदाथ	चामल, मकै, जौ, कोदो, गहुँ	छ.....१ छैन.....२
		जरा (सेतो) र ट्युवरर्स र प्लान्टाईन्स	आलु, सलगम	छ.....१ छैन.....२
E002	दलहन/गेडागुडी (सिमी, मटर, दाल)	दलहन/गेडागुडी (सिमी, मटर, दाल)	दाल, दलहन, मटर, सिमी, भटमास, चना दाल	छ.....१ छैन.....२
E003	Nuts and seeds	Nuts and seeds	मधिसे, बदाम, कटुस, ओखर, मम्फली, बदाम	छ.....१ छैन.....२
E004	दुग्ध उत्पादन	दुध र दुग्ध उत्पादन	दुध, दही, चिज, घीउ, पनिर	छ.....१ छैन.....२
E005	माछा(मासु जन्य	अंगका मासु कलेजो, मुटु, रगत तथा	अंगका मासु कलेजो, मुटु, रगत तथा	छ.....१ छैन.....२
		मासु बाखा, पाठो, खसी, सुंगुर, भैसी, कुखुरा, हास	मासु बाखा, पाठो, खसी, सुंगुर, भैसी, कुखुरा, हास	छ.....१ छैन.....२
		माछा	माछा	छ.....१ छैन.....२

E006	अण्डा	कुखुरा वा हासको अण्डा	कुखुरा वा हासको अण्डा	छ.....१ छैन.....२
E007	गाढा हरियो पत्तेदार तरकारी	गाढा हरियो पत्तेदार तरकारी	पालुङ्गको साग, फर्सीको पत्ता, तोरीको साग, ब्रोकाउली, गाजरको पत्ता	छ.....१ छैन.....२
E008	अन्य भिटामिन ए युक्त फलफुल तथा तरकारीहरु	भिटामिन ए युक्त तरकारी, जरा र ट्युवर	गाजर, फर्सी, सख्खरखण्ड	छ.....१ छैन.....२
		भिटामिन ए युक्त फलफुलहरु	आप, मेवा	छ.....१ छैन.....२
E009	अन्य तरकारीहरु	अन्य तरकारीहरु	बन्दागोभी, काउली,टमाटर, तामा, च्याउ, बैगुन	छ.....१ छैन.....२
E010	अन्य फलफुल	अन्य फलफुल	स्याउ, केरा, अङ्गुर, अम्बा, अमला, कागति, अनार, जामुन, सुन्तला, चुकुंदर	छ.....१ छैन.....२

खण्ड F: जैविक परीक्षण		
हेमोग्लोबिन स्तर (g/dl)	**.....**	

Annex X: Results On Knowledge On Anemia, WIFAS and Dietary Diversity

Table: Knowledge on Anemia (19 item statements questions)

Knowledge on Anemia (19 item statements questions)	WIFAS implemented		Not implemented		Total	
	n	%	n	%	n	%
Anemia is known as "Inadequate blood"	179	59.5	210	69.8	389	64.6
Causes of anemia Lack of Iron and folic acid	86	28.6	84	27.9	170	28.2
Lack of Vitamin A and B-12	61	20.3	92	30.6	153	25.4
Parasitic Infection	13	4.3	49	16.3	62	10.3
Menstrual blood loss	143	47.5	125	41.5	268	44.5
Symptoms of anemia Fatigue	168	55.8	142	47.2	310	51.5
Bleeding	116	38.5	78	25.9	194	32.2
Fast breathing	25	8.3	77	25.6	102	16.9
Pale skin	31	10.3	87	28.9	118	19.6
Faint	132	43.9	112	37.2	244	40.5
Dizziness	179	59.5	107	35.5	286	47.5
Treatment of anemia Take recommended IFA	115	38.2	72	23.9	187	31.1
Intake in iron rich food/diet	131	43.5	145	48.2	276	45.8
Intake of Vitamin A, B12	92	30.6	122	40.5	214	35.5
Using Bed net to prevent from malaria	4	1.3	21	7.0	25	4.2
Consequences of anemia Low attention	63	20.9	96	31.9	159	26.4
Poor Performance	39	13.0	71	23.6	110	18.3
Low immunity	47	15.6	65	21.6	112	18.6
Reduced physical activity	97	32.2	124	41.2	221	36.7

Table: Knowledge on WIFAS (15 item statements questions)

Knowledge statement on WIFAS (15 item statements)	Government		Private		Total	
	n	%	n	%	n	%
IFA is given each week to prevent anemia	222	73.8	164	54.5	386	64.1
Girls are at higher risk of anemia	100	33.2	47	15.6	147	24.4
Girls menstruate each month	265	88.0	212	70.4	477	79.2
Benefits						
Improve concentration at School	98	32.6	62	20.6	160	26.6
Increase blood	246	81.7	147	48.8	393	65.3
Prevent low Iron and folic acid	102	33.9	89	29.6	191	31.7
Improve health	130	43.2	75	24.9	205	34.1
Food items decrease iron absorption						
Coffee	82	27.2	78	25.9	160	26.6
Tea	74	24.6	58	19.3	132	21.9
Milk and Milk Products	116	38.5	62	20.6	178	29.6
Side effects						
Stomach Pain	203	67.4	63	20.9	266	44.2
Vomiting	126	41.9	89	29.6	215	35.7
Black stool	86	28.6	58	19.3	144	23.9
Constipation	29	9.6	31	10.3	60	10.0
Diarrhea	24	8.0	44	14.6	68	11.3

Table: Dietary diversity status of study population

Dietary diversity status (Consumption on last 24 hour)	WIFAS implemented n(%)		Non implemented n(%)		Total n(%)	
Cereals	301	100.0	301	100.0	602	100
Pulses	296	98.3	283	94.0	579	96.18
Nuts and Seeds	80	26.6	89	29.6	169	28.07
Dairy product	221	73.4	200	66.4	421	69.93
Meat	137	45.5	119	39.5	256	42.52
Eggs	95	31.6	128	42.5	223	37.04
Dark green Vegetables	76	25.2	115	38.2	191	31.73
Others Vit A rich Fruits and Vegetables	112	37.2	133	44.2	245	40.70
Other Vegetables	128	42.5	136	45.2	264	43.85
Other Fruits	100	33.2	174	57.8	274	45.51

Annex XI: School approval letters

सरस्वती माध्यमिक विद्यालय
Saraswati Secondary School
टोखा-३, काठमाडौं
Tokha-3, Kathmandu
स्था:२०७८ Estd:2017
Email: saraswatischool32@gmail.com
WWW.saraswatisschool.edu.np
Phone No: 01-5110152

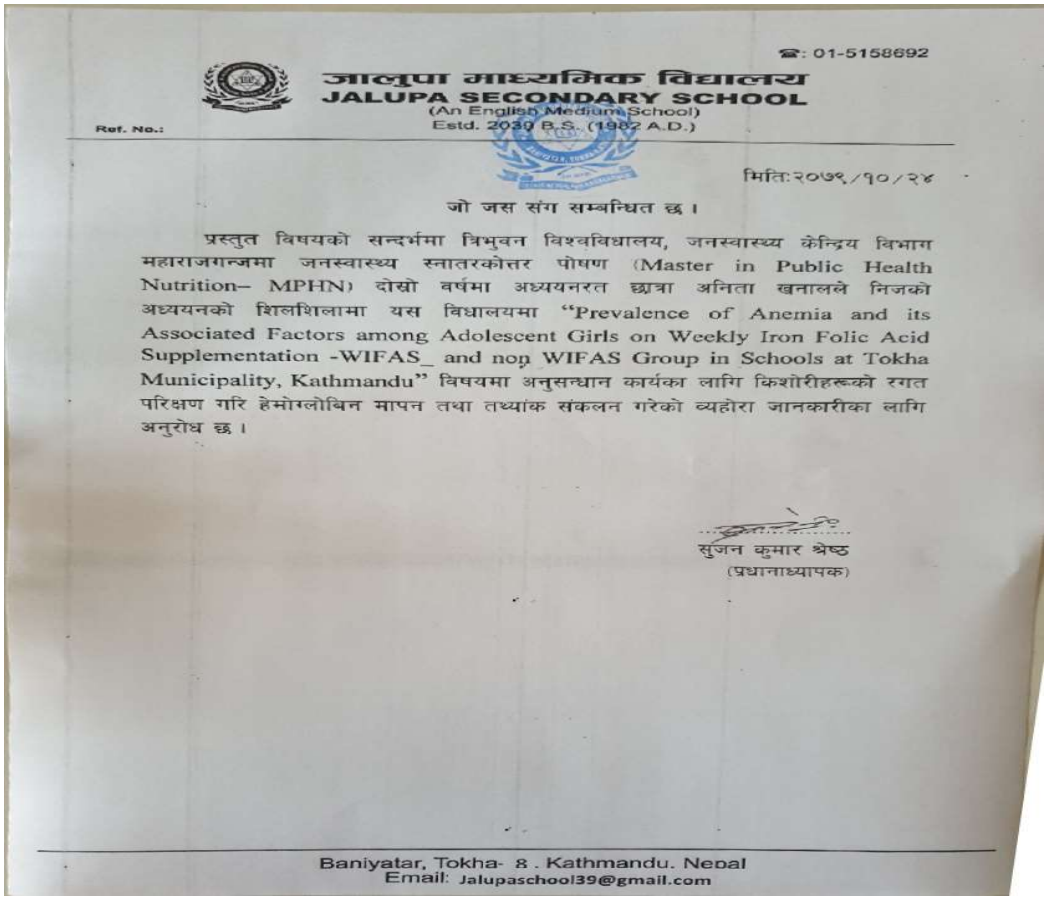
प.स.: ०७८/०८०
च.नं.

मिति : २०७९/०९/२५

विषय : जो जस संग सम्बन्धित छ ।

प्रस्तुत विषयको सन्दर्भमा त्रिभुवन विश्वविद्यालय, जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य स्नातरकोत्तर पोषण (Master in Public Health Nutrition- MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले निजको अध्ययनको शिलशिलामा यस विद्यालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरूको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्यांक संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

अर्जुन श्रेष्ठ
प्रधानाध्यापक



☎: 01-5158692

जालुपा माध्यमिक विद्यालय
JALUPA SECONDARY SCHOOL
(An English Medium School)
Estd. 2039 B.S. (1982 A.D.)

Ref. No.:

मितिः२०७९/१०/२४

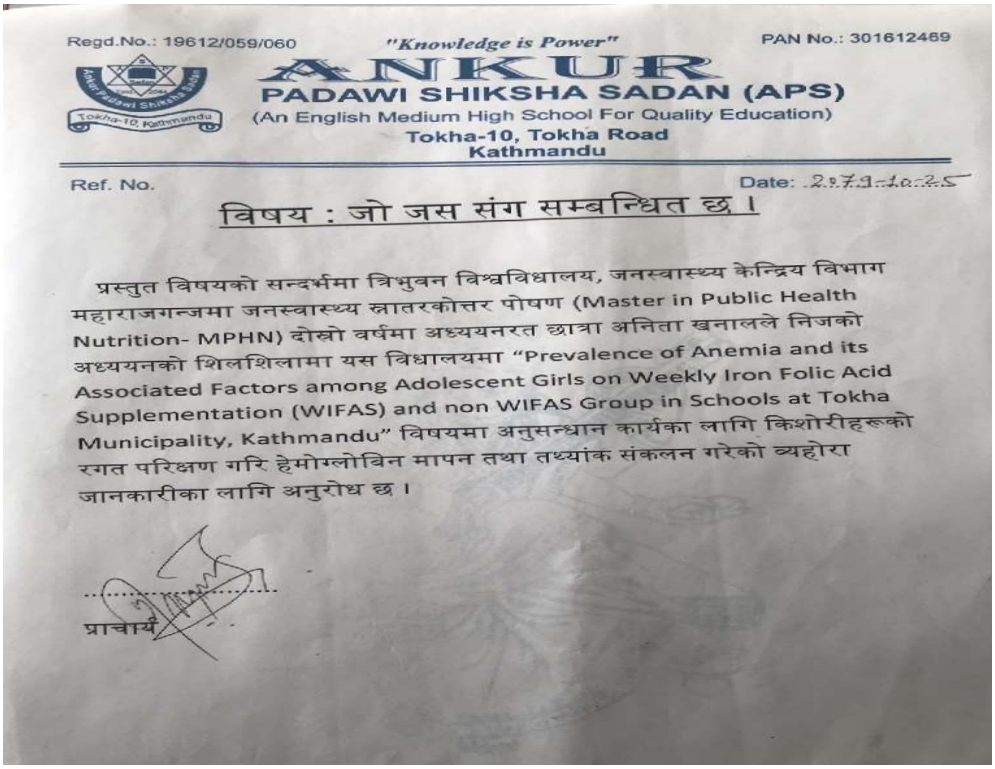
जो जस संग सम्बन्धित छ ।

प्रस्तुत विषयको सन्दर्भमा त्रिभुवन विश्वविद्यालय, जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य स्नातरकोत्तर पोषण (Master in Public Health Nutrition– MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले निजको अध्ययनको शिलशिलामा यस विधालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation -WIFAS_ and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरूको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्यांक संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

सुजन कुमार श्रेष्ठ
(प्रधानाध्यापक)

Baniyatar, Tokha- 8 . Kathmandu. Nepal
Email: Jalupaschool39@gmail.com

Annex XI: School approval letters



Regd.No.: 19612/059/060 "Knowledge is Power" PAN No.: 301612469

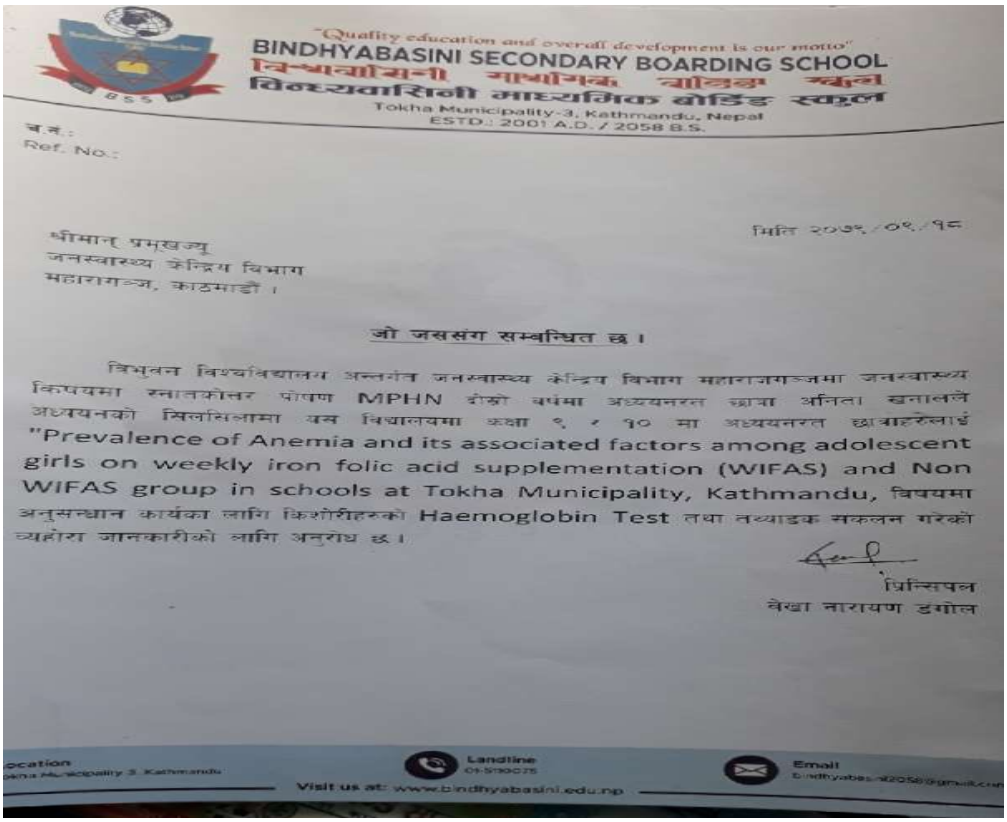
ANKUR
PADAWI SHIKSHA SADAN (APS)
(An English Medium High School For Quality Education)
Tokha-10, Tokha Road
Kathmandu

Ref. No. Date: २०७१-१०-२५

विषय : जो जस संग सम्बन्धित छ ।

प्रस्तुत विषयको सन्दर्भमा त्रिभुवन विश्वविधालय, जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य स्नातरकोत्तर पोषण (Master in Public Health Nutrition- MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले निजको अध्ययनको शिलशिलामा यस विधालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरूको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्यांक संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

प्राचार्य



"Quality education and overall development is our motto"
BINDHYABASINI SECONDARY BOARDING SCHOOL
बिन्धयावासिनी माध्यमिक बोर्डिङ स्कूल
Tokha Municipality-3, Kathmandu, Nepal
ESTD.: 2001 A.D. / 2058 B.S.

च.नं.:
Ref. No.:

मिति २०७९/०९/१८

श्रीमान् प्रमुखज्यू
जनस्वास्थ्य केन्द्रिय विभाग
महाराजगन्ज, काठमाडौं ।

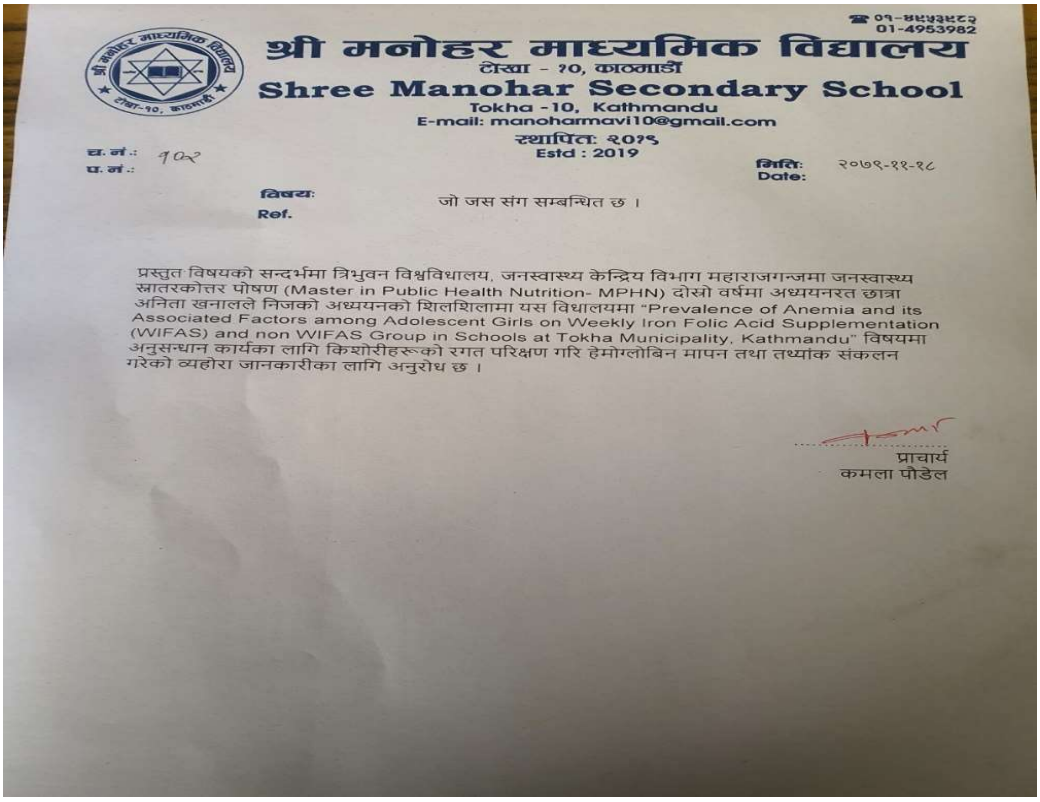
जो जससंग सम्बन्धित छ ।

त्रिभुवन विश्वविद्यालय अन्तर्गत जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य विषयमा स्नातकोत्तर पोषण MPHN दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले अध्ययनको सिलसिलामा यस विद्यालयमा कक्षा ९ र १० मा अध्ययनरत छात्राहरुलाई "Prevalence of Anemia and its associated factors among adolescent girls on weekly iron folic acid supplementation (WIFAS) and Non WIFAS group in schools at Tokha Municipality, Kathmandu, विषयमा अनुसन्धान कार्यका लागि किशोरीहरुको Haemoglobin Test तथा तथ्याङक संकलन गरेको व्यहोरा जानकारीको लागि अनुरोध छ ।

प्रिन्सिपल
वेखा नारायण डगोल

Location
Tokha Municipality 3, Kathmandu
Landline
01-5190075
Email
Visit us at: www.bindhyabasini.edu.np

Annex XI: School approval letters



☎ ०१-४५५३४८३
01-4953982

श्री मनोहर माध्यमिक विद्यालय
टोखा - १०, काठमाडौं
Shree Manohar Secondary School
Tokha -10, Kathmandu
E-mail: manoharmavi10@gmail.com
स्थापित: २०१९
Estd : 2019

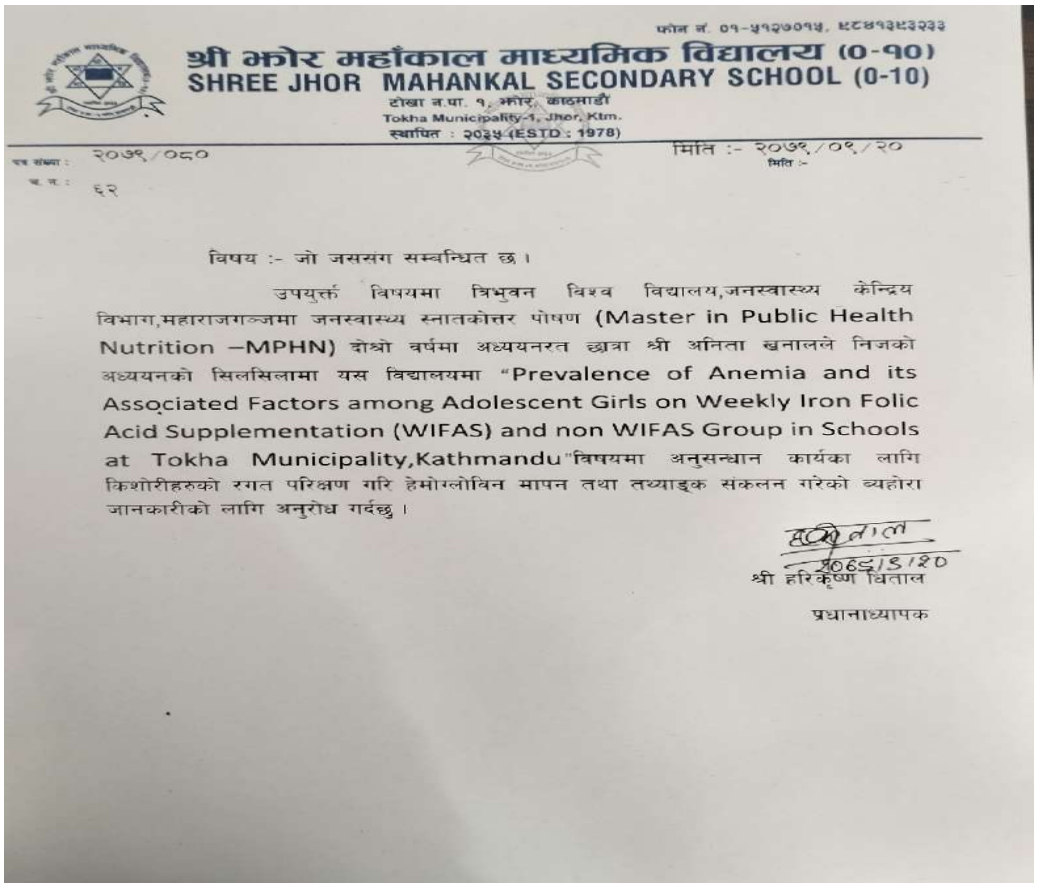
च. नं.: १०२
प. नं.:

मिति: २०७९-११-१८
Date:

विषय:
Ref. जो जस संग सम्बन्धित छ ।

प्रस्तुत विषयको सन्दर्भमा त्रिभुवन विश्वविधालय, जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य स्नातरकोत्तर पोषण (Master in Public Health Nutrition- MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले निजको अध्ययनको शिलशिलामा यस विधालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरूको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्यांक संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

प्राचार्य
कमला पौडेल



फोन नं. ०१-५१२७०१५, ४८४१३४३२३३

श्री झोर महाँकाल माध्यमिक विद्यालय (0-10)
SHREE JHOR MAHANKAL SECONDARY SCHOOL (0-10)
टोखा न.पा. १, झोर, काठमाडौं
Tokha Municipality-1, Jhor, Ktm.
स्थापित : २०३५ (ESTD : 1978)

पत्र संख्या : २०७९/०८०
च. नं. : ६२

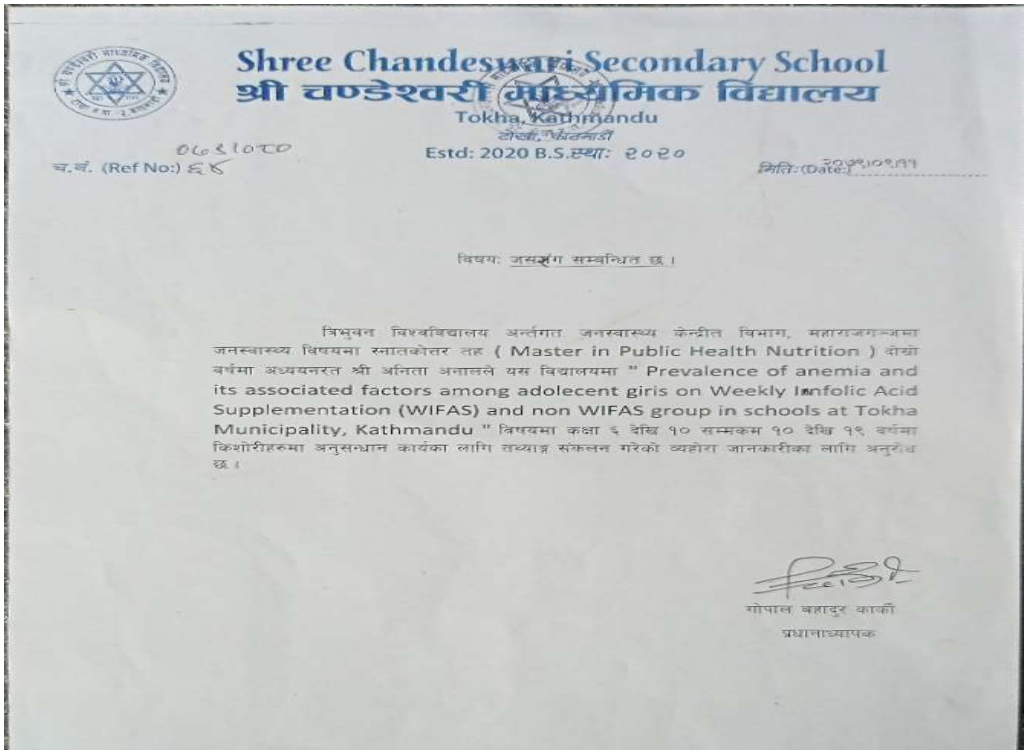
मिति :- २०७९/०९/२०
मिति :-

विषय :- जो जससंग सम्बन्धित छ ।

उपर्युक्त विषयमा त्रिभुवन विश्व विद्यालय,जनस्वास्थ्य केन्द्रिय विभाग,महाराजगन्जमा जनस्वास्थ्य स्नातकोत्तर पोषण (Master in Public Health Nutrition –MPHN) दोश्रो वर्षमा अध्ययनरत छात्रा श्री अनिता खनालले निजको अध्ययनको सिलसिलामा यस विद्यालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality,Kathmandu"विषयमा अनुसन्धान कार्यका लागि किशोरीहरुको रगत परिक्षण गरि हेमोग्लोविन मापन तथा तथ्याइक संकलन गरेको व्यहोरा जानकारीको लागि अनुरोध गर्दछु ।

२०७९।९।२०
श्री हरिकृष्ण धितास
प्रधानाध्यापक

Annex XI: School approval letters



Shree Chandeswari Secondary School
श्री चण्डेश्वरी माध्यमिक विद्यालय
Tokha, Kathmandu
टोखा, काठमाडौं
Estd: 2020 B.S. स्थापना: २०२०

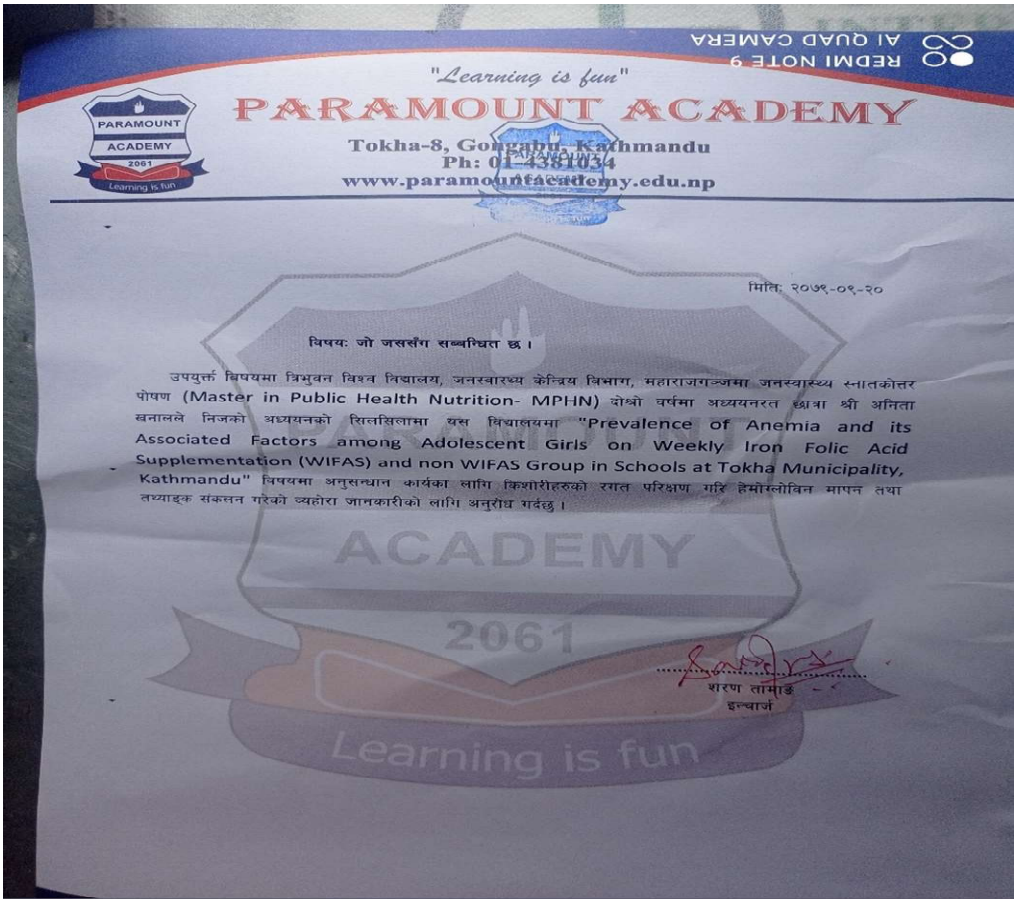
च.नं. (Ref No:) ६५

मिति: (Date:)

विषय: जानकारी सम्बन्धित छ ।

त्रिभुवन विश्वविद्यालय अर्न्तगत जनस्वास्थ्य केन्द्रीत विभाग, महाराजगन्जमा जनस्वास्थ्य विषयमा स्नातकोत्तर तह (Master in Public Health Nutrition) दोस्रो वर्षमा अध्ययनरत श्री अनिता अनालले यस विद्यालयमा " Prevalence of anemia and its associated factors among adolecent giris on Weekly Iinfolic Acid Supplementation (WIFAS) and non WIFAS group in schools at Tokha Municipality, Kathmandu " विषयमा कक्षा ६ देखि १० सम्मकम १० देखि १९ वर्षमा किशोरीहरुमा अनुसन्धान कार्यका लागि तथ्याङ्क संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

गोपाल बहादुर काकी
प्रधानाध्यापक



REDMI NOTE 9
AI QUAD CAMERA

"Learning is fun"

PARAMOUNT ACADEMY
Tokha-8, Gongabu, Kathmandu
Ph: 01-4361034
www.paramountacademy.edu.np

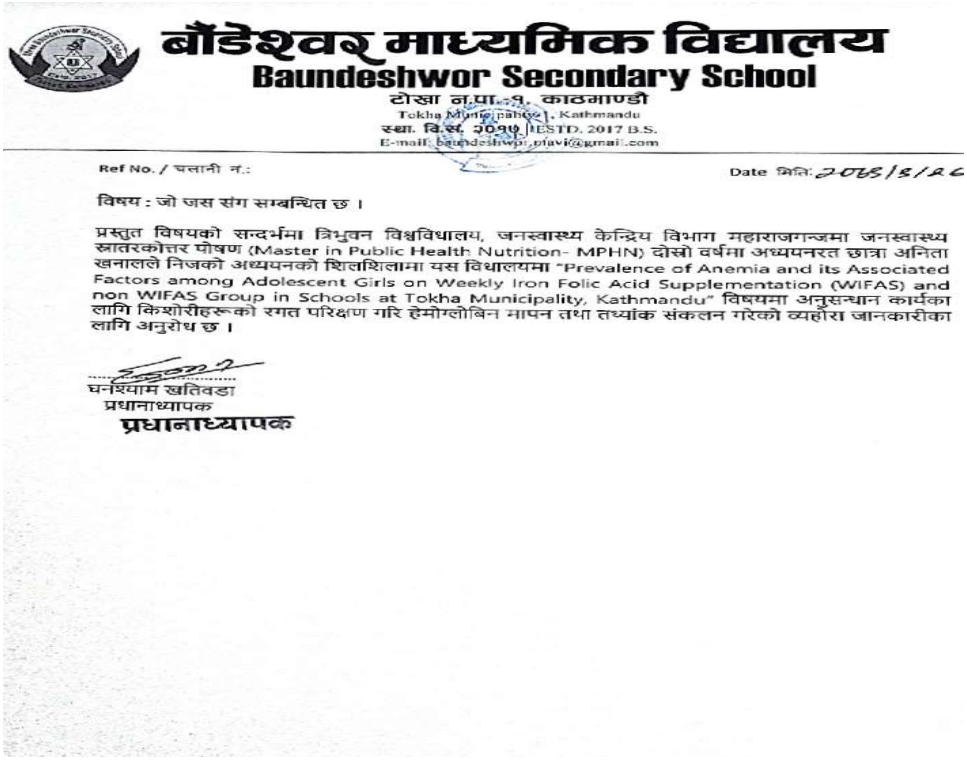
मिति: २०७९-०९-२०

विषय: जो जसलाँग सम्बन्धित छ ।

उपयुर्क्त विषयमा त्रिभुवन विश्व विद्यालय, जनस्वास्थ्य केन्द्रिय विभाग, महाराजगन्जमा जनस्वास्थ्य स्नातकोत्तर पोषण (Master in Public Health Nutrition- MPHN) दोश्रो वर्षमा अध्ययनरत छात्रा श्री अनिता खनालले निजको अध्ययनको सिलसिलामा यस विद्यालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरुको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्याङ्क संकलन गरेको व्यहोरा जानकारीको लागि अनुरोध गर्दछु ।

शरण तामाङ
इन्चार्ज

Annex XI: School approval letters



बौंडेश्वर माध्यमिक विद्यालय
Baundeshwor Secondary School
टोखा न.पा.-१, काठमाण्डौ
Tokha Municipality-1, Kathmandu
स्था. वि.सं. २०१७ | ESTD. 2017 B.S.
E-mail: baundeshwor.pravi@gmail.com

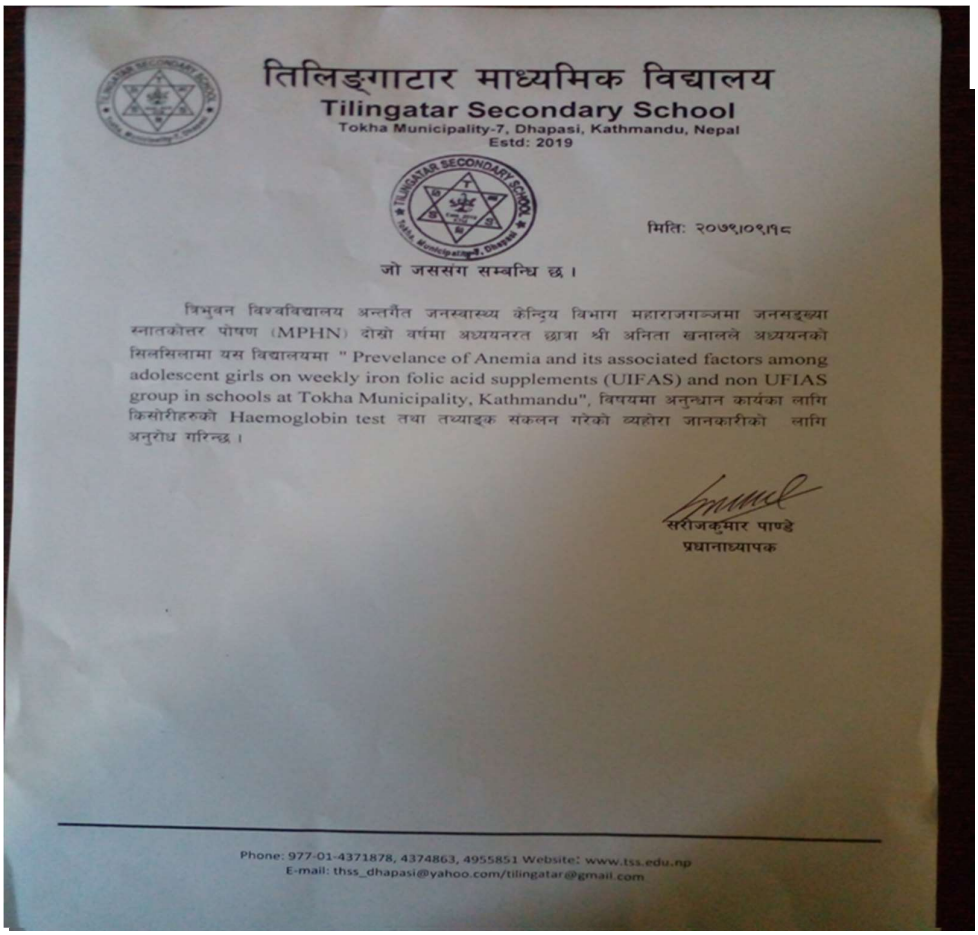
Ref No. / चलानी नं.:

Date मिति: २०७९/९/२८

विषय : जो जस संग सम्बन्धित छ ।

प्रस्तुत विषयको सन्दर्भमा त्रिभुवन विश्वविधालय, जनस्वास्थ्य केन्द्रिय विभाग महाराजगन्जमा जनस्वास्थ्य स्नातकोत्तर पोषण (Master in Public Health Nutrition- MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा अनिता खनालले निजको अध्ययनको शिलशिलामा यस विधालयमा "Prevalence of Anemia and its Associated Factors among Adolescent Girls on Weekly Iron Folic Acid Supplementation (WIFAS) and non WIFAS Group in Schools at Tokha Municipality, Kathmandu" विषयमा अनुसन्धान कार्यका लागि किशोरीहरूको रगत परिक्षण गरि हेमोग्लोबिन मापन तथा तथ्यांक संकलन गरेको व्यहोरा जानकारीका लागि अनुरोध छ ।

घनश्याम खतिवडा
प्रधानाध्यापक
प्रधानाध्यापक



तिलिङगाटार माध्यमिक विद्यालय
Tilingatar Secondary School
Tokha Municipality-7, Dhapasi, Kathmandu, Nepal
Estd: 2019

मितिः २०७९।०९।१८

जो जससंग सम्बन्धि छ ।

विभुवन विश्वविद्यालय अन्तर्गत जनस्वास्थ्य केन्द्रिय विभाग महाराजगञ्जमा जनसङ्ख्या स्नातकोत्तर पोषण (MPHN) दोस्रो वर्षमा अध्ययनरत छात्रा श्री अनिता खनालले अध्ययनको सिलसिलामा यस विद्यालयमा " Prevelance of Anemia and its associated factors among adolescent girls on weekly iron folic acid supplements (UIFAS) and non UFIAS group in schools at Tokha Municipality, Kathmandu", विषयमा अनुन्धान कार्यका लागि किसोरीहरुको Haemoglobin test तथा तथ्याङ्क संकलन गरेको व्यहोरा जानकारीको लागि अनुरोध गरिन्छ ।

सरोजकुमार पाण्डे
प्रधानाध्यापक

Phone: 977-01-4371878, 4374863, 4955851 Website: www.tss.edu.np
E-mail: thss_dhapasi@yahoo.com/tilingatar@gmail.com