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A Study of Socioeconomic Determinants of Anemia among Expecting Mothers in Khyber Pakhtunkhwa Pakistan

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ABSTRACT

One of the instrumental factors contributing towards the GDP of any country is human capital and for a progressive human capital, the main resource is physical and mental health. Females constitute approximately 48% of population of Pakistan, out of which a great number suffer from nutritional deficiency anemia at their reproductive age, which results in an unhealthy child. This study is designed to find the socioeconomic factors that lead to anemia among expecting women. The research design for this study is case control where data was collected from two groups; control group (non-anemic pregnant women) and case group (anemic pregnant women) registered in the Basic Health Unit (BHU) from different areas of Peshawar. Collected data was analyzed using binary logistic regression. Findings revealed that monthly income of household, independent members or number of employed members of the family, gap between children, non-staple food consumption and supplements continuity have significant inverse relationship with anemia, indicating that increase in mentioned variables will decrease the prevalence of anemia in pregnant women of rural areas. The study concluded that anemia being a common grievance amongst pregnant women is mostly caused by low level of monthly income, family size with lower number of employed members, low frequency of non-staple food consumption per week, lack of continuity of iron supplements and poor health seeking behavior. Awareness regarding attainment

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of education irrespective of gender, government focus on health promotion interventions and more job opportunities can improve health conditions and socioeconomic status of women in Khyber Pakhtunkhwa.

1. Introduction

The word ‘Anemia’ is derived from two Greek words ‘an’ means ‘without’ and ‘haima’ means ‘blood’. It was called ‘anaimia’ meaning without blood till late 18th century. However, in the early 19th century via modern Latin it came to be called as ‘anemia.’ Red blood cells (also called erythrocytes or RBC’s) contains a special protein called ‘hemoglobin’ which helps to carry oxygen from the lungs to the rest of the body and then returns carbon dioxide from the body to the lungs so that it can be exhaled. When the level of hemoglobin decreases, it results in anemia. In other words, anemia diminishes the capacity of the blood to carry oxygen to different organs of human body due to which an individual faces pallor and weariness, (American Society of Hematology, 2017; World Health Organization, 1992). There are more than 400 types of anemia, which are divided into three groups.

The first group of anemia indicates symptoms of blood loss. Chronic blood loss anemia is most often the result of chronic gastrointestinal bleeding. It is due to conditions such as ulcers, hemorrhoids, gastritis (inflammation of the stomach) and cancer. Similarly, another cause of blood loss is use of non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin or ibuprofen, which can cause ulcers and gastritis. Menstruation is another potential cause of this issue, especially if menstrual bleeding is excessive.

Next group is of patients whose red blood cells may be faulty or decreased due to abnormal red blood cells or a lack of minerals and vitamins needed for red blood cells to work properly. Conditions associated with these causes of anemia include the sickle cell anemia, iron-deficiency anemia, vitamin deficiency, bone marrow and stem cell problems, and other health conditions.

The third group comprises of people suffering from hemolytic anemia. These inherited conditions include sickle cell anemia and thalassemia. It may also result from stressors such as infections, drugs, snake or spider venom, or certain foods. Moreover, the toxins from advanced liver or kidney disease and inappropriate attack by the immune system (called hemolytic disease of the newborn when it occurs in the fetus of a pregnant woman) are also some of the prominent characteristics identified in the patients of this group. Other symptoms may include vascular grafts, prosthetic heart values, tumors, severe burns, exposure to certain chemicals, severe hypertension and clotting disorders.

Amongst the aforementioned three groups of anemia, iron deficiency anemia (IDA) from the second group is extremely common in individuals and is the most prevalent cause of anemia worldwide. There are various causes of IDA, but it occurs mostly due to lack of the mineral iron in the body due to insufficient nutrition intake (NHANES, 2012). It is affecting 50% of females at reproductive age globally and two-third of pregnant women of developing countries (World Health Organization, 2007, 2014; Mehta, 2015). Almost 50% of Pakistani females at their reproductive age are suffering from anemia amongst which 21% of the anemic females are aged between 9-29 years and similar conditions are faced by the females of Punjab, a province of Pakistan (Mazhar, 2015; Akhtar. 2013).

Results of the studies conducted in our neighboring country, India, on prevalence of anemia among females, has similar outcomes (Jawarkar, Lokare & Kizhatil, 2015). The factors that are considered as the determinants of anemia are age, social class, stress, menstrual blood loss, and dietary deficiencies. Helminthic infection is another factor caused by different species of parasitic worms, mostly soil transmitted infections. Anemia is mostly detected in the underweight females having body mass index (BMI) less than 18.5 kg/m^2. Hence, it shows that the nutritional status has significant relationship with anemia in the young females (Jawed et al., 2017).

Micronutrients are very important for human body because human being need them to have strong mental and physical health, to fight with numerous diseases and produce strong and healthy children. In most cases, deficiency of micronutrient such as iron is caused by inadequate access to food and high burden of disease. Moreover, improvement in the dietary intake and quality of food also plays a significant role in developing healthy human body. Minerals and vitamins are required for body tissues and plays a vital role in human body growth and development (Khan, 2015). Multiple reasons and factors play a significant role in causing anemia. The existence of anemia in human body varies according to socioeconomic status, dietary deficiencies, different infectious diseases, cultural taboos, multiple pregnancies and genetic hemoglobin (Ahmad et al., 2010). As there are multiple antecedents of anemia, nevertheless, common type of anemia is iron deficiency, which is nutritional deficiency disorder. Although, nutritional deficiency anemia affect members of both sexes and all age groups however, the problem among women is more dominant. Moreover, according to estimation nutritional deficiency anemia affects almost two-third of pregnant women in developing countries. The prevalence of anemia among pregnant women therefore results in maternal morbidity and mortality, low birthrate and even neonatal death. (Dharmalingam et al., 2010; World Health Organization, 1992)

Anemia is most prevalent public health problem and it is indicated mostly in poor nutrition and health. Moreover, anemia is widespread in young females and pregnant women due to nutritional deficiency, poor health facilities, lack of awareness and education (World Health Organization, 2016). Furthermore, in developing countries, poor pregnancy outcomes are mostly due to improper intake of iron rich food and supplements, which mostly occurs due to lower socioeconomic status and lack of awareness regarding basic nutritional requirement especially during pregnancy (United Nation Standing Committee on Nutrition UNSCN, 2004).

Past studies have indicated that improper nutritional intake is one of the main causes of IDA and few studies had found it widely prevalent in low and middle-income countries. Therefore, income status of the household is very important factor for availing the facility of iron rich food and supplements during pregnancy (United Nation International Children’s Emergency Fund/World Health Organization, 1999). Low income reduces the iron intake and increase in the prices of meat and fresh fruits make them less affordable (Bhargava et al., 2000). There is significant impact of low socioeconomic status on iron intake status as low household income (<US$ 116.7 per month) was associated with high prevalence of iron deficiency anemia (Ngui, 2012).

In Pakistan, the prevalence of anemia among pregnant women is reported to be 29% in urban areas and 47% to 50% in rural areas (Pakistan Medical Research Council, 1998; Lone et al., 2004). Maternal anemia is one of the causes for prevalence of malnutrition in children under age of three years in the rural areas of Peshawar. Maternal anemia was observed in 72.8% mothers of malnourished children (Gul & Kibria, 2013). Therefore, a case control study will help to find the impact of socio-demographic and socioeconomic factors on anemia among pregnant mothers.

Furthermore, significant relation of family planning, non-staple food and iron supplements intake with anemia needs to be more elaborated in pregnant women not only for mother’s health but for child’s health and development as well. Consequently, findings of this study will indicate the factors causing anemia, which will play a major role in bringing awareness amongst the people of the area. Moreover, it will help the organizations working in the field of health to work in these areas. It will also assist the practitioners by involving respective government departments with an aim to eliminate the causes of anemia in the region.

As maternal anemia is one of rising health issue therefore, the aim of this study is to find the impact of sociodemographic and socioeconomic factors on anemia among pregnant mothers. Further, a case control study will help to analyze the impact of factors in more detail. The purpose of the study at hand was to investigate:

- Socioeconomic and sociodemographic determinants of anemia in expecting mothers.
- The impact of family planning on anemia in pregnant women.
- The impact of non-staple food and iron supplements intake status on anemia in pregnant women.

1.1 Theoretical framework

The analysis of this paper is grounded on the theoretical framework proposed by Grossman (1972). The Grossman model primarily focuses on the interrelationship between an individual health their socioeconomic status (e.g. wealth, wage and earning), their demand for consumption, as well as for medical goods and services, and lastly time investment in health.

From a purely economic perspective, health is a capital that individuals used to produce output of 'healthy time', (Grossman 1972, 2000). Health is one of major determinant on the basis of which an individual allocate an amount of time that could be spend on both market and non-market activities. Furthermore, health provides utility which an individual wants to maximize subject to individual recourses' constraint. Whereas health production function provides information about health status input and output over specified period, where each family member is producer of his own and other family members' health (Grossman, 1972, 2000).

Many studies contributes to the understanding of the socioeconomic inequalities in health and focused on finding the causal relationship between health and socioeconomic factors.

These studies identify the underlying apparatus that explains the causal relationship between health and socioeconomic status such as employment and income (e.g. Smith, 1999; Garcia-Gomez *et all*, 2013). Whereas some studies intend to study relationship of health with socioeconomic characteristics particularly education (e.g. Lleras-Muney, 2005; Conti, Heckman and Urzua, 2010; Van Kippersluis *et all*, 2011).

However, much of the research have failed to explain the exact mechanism through which education leads to achieving a better health advantage. Case and Deaton (2005) note that "*it is extremely difficult to untangle the links between work, earnings, health, and education, without some sort of guiding framework*". Therefore, Grossman model

(1972a;b) provides a solid foundation for the study of health inequalities across socioeconomic groups (Galama and Van Kippersluis, 2013).

Furthermore, Galama and Van Kippersluis (2018) presented a new model that incorporated a life-cycle model of different behaviors that explain a large portion of the observed disparities. This new model serves as a conceptual framework for the SES-Health gradient as well as a more developed framework for the production of health. Model includes socioeconomic determinants such as wealth, earnings, education, health investments and healthy and unhealthy consumption.

Based on the discussion above, conceptual framework to analyze the socioeconomic determinants of anemia among expecting mothers is grounded on health-capital theory. Like other decision makers, pregnant woman (producer of health) makes decision within the constraint they have. Health status (prevalence of anemia among pregnant women in our case) may influenced by socio economic factors.

$$H = F(X) \dots\dots (1.1)$$

Where "H" is health status output and "X" is vector of different socio economic input factors. Health output is proxy by prevalence of anemia among pregnant women while "X" can be divided into following sub factors.

$$H = F\,(M, S, Z) \dots..(1.2)$$

Where "M" is the vector of economic variables, "S" is a vector of social variables and "Z" is the vector of environmental variables.

The prevalence of anemia is also caused by other different factors such as dietary intake, level of income and education level because if the frequency of intake of iron food is twice or more per week before pregnancy, it increases the hemoglobin level. Studies suggest that around two-thirds of the social gradient in health deterioration could be explained by working environment and lifestyle factors alone (Borg and Kristensen, 2000). Therefore, nutritional status of pregnant women has significant relation with anemia. Similarly, income level of household and education level of the mother is also significantly associated with anemia (Ansari et al., 2008). The socioeconomic and demographic status has significant impact on anemia among pregnant women. As, high income level of house hold, education of pregnant women, improving the nutritional status in the form of consuming iron rich food and supplements can decrease the percentage of anemic women (Rizvi,2012). The iron deficiency anemia widely persist in Pakistan among pregnant women and children under 5 years of age and one of the very prominent factor associated with anemia is monthly income of household which has significant relation with iron deficiency anemia (Akhtar et al., 2013).

Past studies have highlighted the prevalence of anemia under the light of different factors. Current study under the heading of socio-economic, family planning, socio-demographic and food and supplements analyzed its impact on prevalence of anemia in pregnant women of rural areas of Peshawar. It accentuates that age, gap between children, total children, iron deficiency, non-staple food consumption and supplements continuity has direct effect on anemic and non-anemic condition of expecting women as these factors are directly linked with the human body.

Additionally, factors like education level of respondent, education level of spouse, family size, independent members, dependent members and monthly income has indirect effect on anemic condition of expecting women. Education increases health consciousness and thus leads to an efficient use of medical and preventive care usage and time involvement in the production of health investment, (Grossman 1972, 2000). Increase or decrease in education level of respondent and her spouse, independent and dependent members and monthly income primarily have impact on awareness regarding gap between children, iron rich food and supplements and their purchasing power. It eventually has an impact on the condition of anemic and non-anemic pregnant women.

Therefore, assessment of these variables with anemia can become tool for the awareness among people. Furthermore, if government implements progressive rules and measures for treatment it can lead to the goal of having healthy mothers and children.

2. Methodology

Gul and Kibria (2013) stated that there is 72.8% maternal anemia, which is one of the factors causing malnutrition in children in the areas of Pishtakhara and Sarband. Therefore, study has been conducted in three rural areas namely Pishtakhara, Sarband and Sangu in Peshawar in order to find out the factors associated with anemia in the pregnant mothers. Primary data based on cross sectional study design was collected through semi-structured questionnaire from 300 pregnant women, from November 2017 to February 2018. Data was collected from those pregnant respondents who were registered as anemic and non-anemic in BHU of each rural area through semi-structured questionnaire from each respondent individually by researcher.

2.1 Sampling Design

Data of household size was collected from Pakistan Bureau of Statistics, Government of Pakistan, Census results 2017. These areas in terms of roads, streets, sanitation system, drinking water system, schools and health seems to be underdeveloped. Livelihood of people depends on daily wages. Due to lower education level men work as laborers, rickshaws and taxi drivers, some depend on farming. Moreover, people with education have jobs but due to lack of job opportunities have small shops.

A multistage sampling technique was used. At first stage total sample size was calculated on the following assumptions:

Expected prevalence of using non-food items as a risk factor for anemia during pregnancy among women with moderate to severe anemia: 20.7% (Ansari et al, 2008).

Expected prevalence of using non-food items as a risk factor for anemia during pregnancy among women with no anemia: 7.2% (Ansari et al 2008).

Based on above findings about percentage of anemic and non-anemic pregnant women, OpenEpi[1] software calculated 300 sample size for the current study.

At second stage through cluster sampling technique, which is a type of probability sampling technique, three clusters (three rural areas) were selected based on convenience, Sangu, Sarband and Pishtakhara (Gul and Kibria, 2013). Data was collected from the BHU of each rural area.

The number of registered pregnant mothers was 144 in the BHU of Sangu, 286 in the BHU of Sarband and 336 in the BHU of Pishtakhara from November 2017 to February 2018. Hence, the total population in terms of registered pregnant mothers was 766.

The total sample size 300 makes 39% of the total population size, according to the following formula:

$$N_i = \frac{n}{N} \times 100 \dots \dots (2.1)$$

Where, N_i = required sample size

n = Sample size

N = Total population

Mathematically,

$$N_i = \frac{300}{766} \times 100 = 39\% \dots \dots (2.2)$$

[1]OpenEpi (Open Source Epidemiologic Statistics for Public Health, Version 3.01).

Therefore, from each cluster, 39% of the total registered pregnant mothers were selected, which was 56 out of 144, 112 out of 286 and 132 out of 336 registered expecting women in BHU of Sangu, Sarband and Pishtakhara respectively.

Furthermore, the study has two groups; study group[2] and control group[3], which means that from total sample size 150 was our study group and 150 was control group. As Dandajena (2013) has argued that equal representation of patients suffering from anemia and the one who is not suffering from this disease can help in understanding the impact of independent factors on the dependent variable more accurately. Therefore, from the first cluster of 56 sample size data was collected from 28 anemic and 28 non-anemic expecting mothers from the second cluster of 112 sample size 56 anemic and 56 non-anemic were surveyed and similarly from the third cluster out of sample size of 132, data was collected from 66 anemic and 66 non-anemic pregnant mothers.

2.2 Logistic Regression

To analyze the relationship between a dependent variable with one or more than one independent variable, methods of regression are used. Among the methods of regression, logistic regression techniques are used when dependent variable is categorical. Hence, Binary (binomial) Logistic regression is used when the dependent variable is binary/dichotomous, such as (use or not use, save or no save, presence or absence, success or failure etc.), (McCullagh, 1989). Usually, the categories are coded as 0 and 1, where 0 is coded for failure/absence while 1 is coded for success/presence.

To quantify the relationship between dependent variable which is of binary nature and the predictors (independent variables), method of odds ratios is used in logistic regression (Kleinbaum, 2008). Where, the odds of happening of an event (e.g. the event that Y = 1) is defined as the ratio of the probability that the event will occur divided by the probability that the event will not occur. That is, the odd of event A is given by:

$$Odds(E) = \frac{P(A)}{P(A\prime)} = \frac{P(A)}{1-P(A)} \dots \dots (2.3)$$

Where A is an event defined as mothers diagnosed with anemia.

The logistic model can be written as:

[2] Pregnant mothers registered as anemic, having Hb less than 11gm/dL, in the BHU of Sangu, Sarband and Pishtakhara

[3] Pregnant mothers registered as non-anemic, having Hb equal to and greater than 11 gm/dL, in the BHU of Sangu, Sarband and Pishtakhara.

$$p\left(\frac{\pi}{1-\pi}\right) = \frac{\exp(\beta_0 + \beta_1 x_1 + \dots\dots\dots\dots\dots\dots + \beta_p x_p)}{1+\exp(\beta_0 + \beta_1 x_1 + \dots\dots\dots\dots\dots\dots + \beta_p x_p)} \dots\dots. (2.4)$$

Where π represents probability of occurrence with the value 1 while 1- π for probability of failure with the value 0.

In order to have linear combination of *n* explanatory variables, the logistic transform of the corresponding success probabilities *pi* follows as:

$$Ln\left(\frac{\pi}{1-\pi}\right) = \left(\beta_0 + \beta_1 x_1 + \dots\dots\dots\dots\dots\dots + \beta_p x_p : 0 \leq \pi \leq 1\right) \dots\dots (2.5)$$

Where β_0 is intercept and $\beta_1, \dots\dots\dots, \beta_p$ are regression coefficients of the explanatory variables.

Therefore, for the current study the following equation has been designed according to selected dependent and independent variables to find the impact of these independent variables on anemia which is the outcome variable of the study:

$$\begin{aligned} Logit(A_{nemia}) &= \beta_0 + \beta_1 Age_{res} + \beta_2 Edu_{res} + \beta_3 Edu_s + \beta_4 Fam_s + \beta_5 Ch_t \\ &+ \beta_6 Gap_{ch} + \beta_7 Ind_m + \beta_8 Dep_m + \beta_9 I_H + \beta_{10} NS.Food_{freq} \\ &+ \beta_{11} Supp_{con} + e \qquad \dots\dots (2.6) \end{aligned}$$

Whereas, the independent variables are age of respondent (pregnant mother), family size, independent members, dependent members, education level of respondent, education level of spouse, total number of children, gap between children in years, non-staple food (beef, eggs, milk, fruits) intake frequency per week, supplements continuity status and monthly income of the house hold. Moreover, the dependent variable in this study is anemia.

2.3 Methods of Estimation of Logistic Regression

Method of maximum like hood is the commonly used method to estimate the parameters of a logistic regression model. It is defined as the joint probability function of random variables specifically, suppose $(x_1, x_2, \dots\dots\dots, x_p)$ are *p* independent random observations correspond to the random variables $(X_1, X_2, \dots\dots\dots, X_p)$ the probability function of x_i is:

$$(X = x_i) = \pi_i^{y_i} \quad (1-\pi_i)^{1-xi}, \qquad x_i = 0 \text{ or } 1, i = 1,2, \dots\dots\dots, n \quad \dots (2.7)$$

The log likelihood functions as:

$$L(\beta_0, \beta_1, \dots, \beta_p) = \sum_{i=0}^{n} y_i(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_p x_p) - \sum_{i=0}^{n} \ln\{1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_p x_p)\} \quad \dots\dots(2.8)$$

The most effective and well known Newton Raph SOL iterative method can solve the equations.

2.4 Test of goodness of model fit

Pseudo R^2 for logistic regression

In order to measure the predictive power of a model, R^2 is used whereas it is used to measures the amount of variation in the dependent variable which is explained by the independent variable in a linear regression. The R^2 for logistic regression is estimated by the Cox and Snell R^2 computed as:

$$Cox\ \&\ Snell\ Pseudo\ R^2 = [\frac{-LL_0 - LL_k}{-LL_0}]^{n/2} \dots\dots(2.9)$$

Where LL_0 is the log likelihood of the null model and LL_k is the log likelihood of the current model. This value cannot reach 1 and Nagelkerke improved it to reach 1. The improved R^2 is given by:

$$Nagelkerke\ Pseudo\ R^2 = 1 - \frac{[\frac{-LL_0 - LL_k}{-LL_0}]^{n/2}}{1 - [-2LL_0]^{n/2}} \dots\dots(2.10)$$

Where LL_0 is the log likelihood of the null model and LL_k is the log likelihood of the current model (Hosmer and Lemeshow, 2000).

Hosmer Lemeshow Test

Hosmer and Lemeshow test is used to find the overall goodness of fit. In order to find goodness of fit test divides subjects into deciles based on predicted probabilities and computes a chi square from observed and expected frequencies using these grouping strategies, the Hosmer Lemeshow goodness of fit of statistic is calculated by using the formula:

$$Hosmer - Lemeshow\ test = \sum_{i=1}^{g} \frac{(0_i - n_i'\hat{\pi}_i)^2}{n_i'\hat{\pi}_i(1 - \hat{\pi}_i)} \dots\dots(2.11)$$

Where, n_i' represents the number of observations in the i^{th}group,

0_i is the observed outcomes in group i, given by: $0_i = \sum_{j=1}^{c_i} y_j$

C_i denotes the number of covariate patterns in the in the i^{th} group

$\hat{\pi}_i$ is the estimated probability that an event outcome for group i and g is the number of groups.

The Likelihood Ratio Test

In the relevance of overall statistical significance, the likelihood ration test (LR) test is performed by estimating two models and comparing the fit of one model to the fit of the other. The likelihood ratio test is performed to test the overall significance of all coefficients in the model on the basis of test statistic:

$$G^2 = [(-2LL_nL_0) - (-2L_nL_0)] \ldots\ldots(2.12)$$

Where, L_0 is the likelihood of the null model and L_n is the likelihood of the saturated model.

The statistic G^2 plays the same role in logistic regression as the numerator of the partial F test does in linear regression. Under the global null hypothesis, $H_0, \beta_1 = \beta_2 = \ldots\ldots\ldots = \beta_P = 0$

The statistic G^2 follows a chi square distribution with p degrees of freedom and measures how well the independent variable affects the response variable.

3. Results

3.1 Descriptive Analysis

Table 3.1 provides descriptive statistics for anemic and non-anemic respondents. Maximum age of anemic respondent was 39 years while non-anemic respondent ages lie between 21 to 33 years. It is apparent from the table that total number of children, family size and dependent members of anemic pregnant mothers are greater from non-anemic pregnant mothers. Moreover, gap between child and independent members of anemic pregnant mothers are less in number as compared to non-anemic pregnant mothers.

Table 3.1: Descriptive Statistics for anemic and non-anemic respondent

	Variables	Unit of Measurement	Min	Max	Mean	S.D
Anemic	Age of Respondent	Years	17	39	26.24	3.49
	Total Children	No of children	0	11	5.73	2.48
	Gap between Child	Years	1.0	2.0	1.13	0.26
	Family Size	No of members	7	31	22.78	5.02
	Independent Members	No of members	1	6	3.2	0.89
	Dependent Members	No of members	6	26	19.57	4.39
Non-Anemic	Age of Respondent	Years	21	33	26.54	2.47
	Total Children	No of children	0.00	7.00	2.95	1.33
	Gap between Child	Years	2.0	4.0	2.37	0.47
	Family Size	No of members	5	27	14.31	4.68
	Independent Members	No of members	1	9	4.23	1.62
	Dependent Members	No of members	4	19	10.07	3.57

For closer inspection, Chi-Square test was carried out to find relation between categorical independent variables. Pearson Chi-square value for respondent education level is 32.795 with df (degree of freedom) 4, which is highly significant. It means that there is significant relationship between levels of education described in various categories towards lifestyle, which results in either anemic or non-anemic condition of respondent. Along with being significant, Pearson Chi-Square value 32.795, which is calculated value, is greater than tabulated value, against P value 0.05 and df 4, which is 9.49. It means that there is association between illiterate, primary, secondary, college and higher education level respondent with anemia.

Similarly, Pearson value is also significant for education level of spouse, monthly income of household, non-staple food consumption per week and supplement continuity. Pearson calculated value for spouse education level is 93.617, with df 4, which is greater than tabulated value 9.49. Moreover, for monthly income of household Pearson calculated value with df 5 is 94.632, which is greater than tabulated value 11.07. Hence, the result exhibits that variation in amount of monthly income of household has significant relation and household with different financial status has different approach towards their health.

Moreover, non-staple food consumption Pearson calculated value at df 3 is 283.704 which is greater than tabulated value 7.81 and supplements continuity Pearson calculated value at df 1 is 113.072 which is greater than tabulated value 3.84 against P value 0.05. Both of the results clearly show that respondent's practice of consumption of healthy food and supplements continuity has significant role towards outcome of health condition. Therefore, difference in status of consumption behavior is associated with anemia.

Table 3.2: Chi-Square Test

Variable	Pearson Chi-Square	Df	Sig
Respondent Education Level	32.795	4	.000
Spouse Education Level	93.617	4	.000
Monthly Income	94.632	5	.000
Non-Staple Food Consumption per Week	283.704	3	.000
Supplements Continuity	113.072	1	.000

3.2 Empirical Results

The results of binary logistic regression model are as follows:

Table 3.3: Omnibus test of model coefficients

Step 1	Chi-square	Df
Step	108.767	17
Block	108.767	17
Model	108.767	17

The value of omnibus tests of model coefficients is Chi-square of 108.767, which is significant at 0.05. Therefore, it can be concluded that adding the predictors to the model have significantly increased the ability to predict factors associated with anemia in pregnant mothers.

Table 3.4: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	78.362[a]	.594	.739

The value of Cox and Snell $R^2$and Nagelkerke $R^2$are 0.594 and 0.739, which are good enough. The Cox and Snell R^2indicates that 59.4% of the variation in the dependent variable anemia was explained by the explanatory variables while Nagelkerke R^2, which is 0.739, indicates that 73.9% of the variability in the dependent variable anemia was explained by the explanatory variables. The p-value of Hosmer and Lemeshow test is 0.489>0.05, hence logistic regression model of this study is good fit.

Table 3.4: Results of binary logistic regression analysis

Variables	B (Coefficient)	S.E.	Wald	Df	Sig.	Exp(B) Odd Ratio	95% C.I.forExp(B)	
							Lower	Upper
Age of Respondent	-.367	.172	4.581	1	.132	.693	.495	.970
Res Edu ref: illiterate			3.516	4	.475			
Primary	-.203	.729	1.752	1	.186	.381	.091	1.590
Secondary	-2.140	1.303	2.550	1	.110	.325	.008	1.628

College	-2.476	1.632	.475	1	.491	.117	.013	7.952
Higher	-3.069	3.761	1.657	1	.401	.487	.001	1.014
Spouse Edu ref: illiterate			13.287	4	.010***			
Primary	-2.273	.866	6.890	1	.009***	.541	.019	1.562
Secondary	-2.937	.923	.475	1	.125	.426	.164	6.114
College	-3.854	.915	.870	1	.351	.399	.071	2.560
Higher	-9.159	1.600	3.899	1	.048***	.103	.024	1.406
Family Size	.534	.126	12.657	1	.000***	1.564	1.222	2.000
Total Children	1.244	.351	6.609	1	.010***	2.468	1.239	4.913
Gap between Children	-2.141	.716	2.851	1	.009***	.350	.023	13.627
Emp. Family Members	-1.201	.123	2.659	1	.012***	.223	.060	1.557
Unemp. family members	.249	.125	3.944	1	.035***	1.780	.610	1.997
Monthly income 5000-15000			13.110	5	.022***			
15000-25000	-1.384	.995	11.565	1	.001***	.352	.005	.895
25000-35000	-3.016	.925	4.155	1	.042***	.144	.025	.930
35000-45000	-3.117	1.446	4.644	1	.031***	.085	.003	.754
45000-55000	-3.700	1.683	4.835	1	.028***	.052	.021	.669
55000-above	-9.192	5.828	7.241	1	.032***	.034	.001	.475
Non-staple food ref: none			10.847	3	.013***			
Daily	-23.193	6.129	4.461	1	.024***	.213	.905	2.604
Twice per week	-21.893	5.457	4.162	1	.035***	.459	.121	7.205
Once per week	-20.180	5.132	2.438	1	.016***	.741	.061	4.350
Supp. Continuity ref: No	-2.493	.879	8.055	1	.005***	.083	.015	.462
Constant	1.657	2.057	.649	1	.421	.191		

*= Significant at 0.10 (10% Significance level and 90% Confidence Interval)

**= Significant at 0.05 (5% Significance level and 95% Confidence Interval)

***=Significant at 0.01 (1% Significance level and 99% Confidence Interval)

The results reveal that age of respondent has positive but insignificant relation with anemia whereas, total children, family size and dependent members has positive and significant relation with anemia. Moreover, education of spouse, gap between children, independent members, monthly income, non-staple food consumption per week and supplement continuity has negative and significant while respondent education have negative but insignificant relation with dependent variable anemia.

Variables such as age of respondent, family size, total children, gap between children, independent members and dependent members are not categorical. On the contrary, education of respondent, education of spouse, monthly income, non-staple food and supplement intake are categorical. Following is the interpretation of the results of above table.

The log odd results showed that an additional year of age of respondent reduces the odd of being anemic by 0.307 times. While the log odd results of family size and total children exhibits that with every single increase in number of member odds of becoming anemic increases by 0.564 and 1.468 times respectively. In terms of gap between children odd ratio result shows that with every increased year as a gap between children odd of level of anemia among pregnant mothers decreases by 0.650 times. Similarly odds of prevalence of anemia among pregnant mothers decreases by 0.777 times with every increase in the number of member being independent (employed member) whereas the odds of prevalence of anemia among pregnant mothers increases by 0.780 times with every increase in the number of member being dependent (unemployed member).

According the above results of the table, respondents having education level up-to primary, secondary, college and higher level had 0.381,0.325,0.117 and 0.487 times the odds, respectively, of becoming anemic as compare to the respondents who were in the illiterate category. Similarly, respondents whose spouse having education up to primary, secondary, college and higher level, had 0.541, 0.426, 0.399 and 0.103 times the odds, respectively, as the spouse of the respondents who were illiterate to get anemic. The respondents who were in 15000-25000, 25000-35000, 35000-45000, 45000-55000 and 55000-above income group had 0.352, 0.144, 0.085, 0.052, 0.021 and 0.001 times the odds, respectively, as compare to those respondents who were in 5000-15000 income group to expose to anemia. Considering the effect of intake of non-staple food, respondents, having status of non-staple food intake on daily basis, twice per week and once per week had 0.213, 0.459 and 0.741 times odds, respectively, as to those who fall in category of none to face anemia. Whereas, the respondents who use to keep continuity in consuming supplements had 0.083 times odds as compare to those who do not consume supplements on continuity basis to become anemic.

4. Discussion

The results based on the sample size used in the analysis in terms of anemic and non-anemic pregnant women's non-staple food consumption per week and supplements continuity shows that lack of intake of iron rich food can strongly affect the level of hemoglobin, which in case of decrease can result in anemia in pregnant women. Hence, prolonged negative iron balance due to insufficient dietary intake during pregnancy contributes in prevalence of anemia (World Health Organization, 2014). It is also evident from the literature that the use of iron rich food and multivitamins sprinkle are very effective during pregnancy and they can be easily added to the routine diet (Hardling et al., 2017; Milman, 2011). According to the results, frequency of non-staple food consumption per week is zero among 85% anemic expecting females and just 15% anemic pregnant women consume non-staple food like beef, eggs, fruits and milk, once per week. On the contrary, 73% non-anemic respondents consume non-staple food twice per week. Similarly, 12% anemic mothers keep continuity in supplements intake while 88% do not, while on the other side 73% non-anemic keep continuity in the intake of iron supplements. There can be many reasons behind poor status of iron rich nutritional intake but during the survey from sample size for current study examined that socio-economic status, which plays a vital role as improvement in monthly earnings, can increase the power of affording the non-staple food and iron supplements. As one of the most important factor that determines the food choices a person can make is the purchasing power, which means that how much one can spend on buying food (Marmot, 1984). Similarly, Jones et al., (1992) found that the children of the rich and middle class family had low prevalence of anemia as compared to those children who belongs to poor house hold because the children from rich and middle class family had better nutritional status. The results of socio-economic variables in terms of dependent, independent members and monthly income shows that non-anemic population size has greater number of independent members and higher monthly incomes as compared to anemic population size of the study. Therefore, it can be stated that if the number of earning members from a family size increases, it will help in raising the monthly earnings and can even overcome the burden of bigger family size. Low income can result in various outcomes in the form of cutting down the purchase of quality food and availing health care services, which can be an antecedent for prevalence of anemia during pregnancy (Kramer, 1987). Similarly, Habte et al., (2013) concluded that if the households with higher family size have more than one employed person that boosts the economic support at house hold level and can improves food availability which can help in decreasing the level of anemia in pregnant females.

Further, the study at hand indicated significant results regarding family planning in terms of total number of children and gap between children. It revealed that the respondents with greater number of children are mostly anemic i.e. 13%, 9%, 3% and 1% have 8, 9, 10 and 11 children respectively. On the contrary, the percentage of non-anemic respondents having the aforementioned number of children is zero.

Similarly, the gap between children is also a serious issue as the results shows that only 19% and 3% anemic respondents keep 1.5 to 2 years gap between their children respectively where 77% have one-year gap between their children. However, the minimum gap, which the non-anemic respondents keep in their children, starts from 2 years. Therefore, it is clear from the findings that family planning can play an important role in improving the condition of anemia as a major health problem especially among pregnant women. Results reveal that 7% and 2% non-anemic mothers also have 5 to 7 children respectively but there is at least two years gap between their children. Hence, it indicated that if a family has up to 5 to 7 children, it can be less harmful for mother's health if there is at least two years of gap between children along with proper intake of non-staple food and supplements continuity. Results are related with the of the study of Khaskheli et al., (2016), which concluded that approximately two-year gap between children can decrease the number of anemic mothers. Findings of this study corroborate with Ansari et al., (2008) and Harding et al., (2017) which concluded that the increase in the size of family and number of children increases the chances of prevalence of anemia in pregnant women.

Independent variables like education level of respondent, which is insignificant whereas, education level of spouse has significant relation, but both have a negative and inverse relation with anemia. The descriptive analysis show that 81% of anemic pregnant women are illiterate while just 13% have primary, 5% have secondary and just 1% has college and higher level of education. On the contrary, 63% spouses of the respondents are illiterate where 11% has secondary, 16% have college and just 3% have higher education.

The condition of non-anemic respondents and their spouses are different in terms of education level. The results indicate that 51% non-anemic respondents are illiterate while 37% has primary, 6% has secondary, 5% has college and 1% has higher education level. Moreover, the results for spouses of the expecting women shows that only 11% spouses are illiterate while 20% has primary, 37% has secondary, 24% has college and 9% has higher education level. Hence, the results show that education level is greater among non-anemic expecting women and in their spouses as compared to the anemic respondents and their spouses. However, during data collection it was observed that attainment of education for females and up to some level for males is not considered as priority due to poverty and other priorities, which mostly include necessities of daily life. Better socio-economic status can improve nutritional status along with the provision of academic opportunities for females (Feinstein et al., 2006).

Therefore, improvement in socio-economic status can improve the living standard of the expecting mothers in terms of good education, which can improve awareness regarding healthy life style and family planning. Moreover, it can develop practice of healthy nutrition in terms of intake of iron rich food and supplements, which can decrease the prevalence of anemia in expecting women up to certain level.

5. Conclusion

The study at hand analyzed the impact of demographic conditions, family planning decisions, socioeconomic status, non-staple food consumption and supplements intake on anemia in the pregnant women of three rural areas of Peshawar, KPK.

The study explored that anemia is a common disease undergone by most of the pregnant women. Its most common cause is low level of monthly income, large family size with lower number of independent members while higher number of dependent members, low frequency of non-staple food consumption per week, lack of continuity of iron supplements and poor health seeking behavior. Additionally family planning decision like keeping gap between children has also negative and significant relation with anemia.

6. Policy Recommendations

The study at hand based on its findings and suggestions from the respondents indicate the following policy recommendations:

1. Awareness regarding attainment of education irrespective of gender should be developed in these rural areas along with improvement in the quality of education in schools. Since respondent education has negative relation with anemia, it indicates that increase in level of education of mothers will decrease the chances of anemia in them. Similarly, it is evident from the significant results and negative relationship that increase in education of respondents' spouse will help in decreasing the percentage of anemic females.
2. The health facilities conditions at Basic Health Units (BHU) in the rural areas needs to develop in terms of basic health facilities. There shall be proper screening facilities available for anemia along with maintaining proper stock of supplements for expecting mothers. During the visit to BHUs of all three rural areas, it was observed that there is no facility for screening of anemia and ambulance for emergency condition. Moreover, the BHUs received enough stock of supplements for whole month but during the first week administration used to come up with an excuse that they are out of stock resulting in discontinuity of supplements intake. Hence, the results indicated a significant relation of continuity of supplements intake status with anemia.

3. Steps for awareness regarding importance of family planning should be taken as the results of the study suggests that increase in the gap between children can mitigate the condition of anemia.
4. Expecting mothers should be provided with free food vouchers by the government in order to facilitate quality food intake.
5. In order to improve the socioeconomic status of the households, more job opportunities should be provided as increase in monthly income and number of employed members of family has significant relation with anemia. Moreover, it indicates that if government works on improving the employment status it will improve the income status of households, which can leads towards adopting healthy life style.

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