Research Journal of Social Sciences & Economics Review
Vol. 3, Issue 4, 2022 (October – December)
ISSN 2707-9023 (online), ISSN 2707-9015 (Print)
ISSN 2707-9015 (ISSN-L)
DOI: https://doi.org/10.36902/rjsser-vol3-iss4-2022(34-37)

RJSSER
Research Journal of Social Sciences & Economics Review

Anemia and its Causes among Children in District Dir Lower Applying Ranked Set Sampling Method for Data Collection

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Abstract

The present study estimated the incidence and risk factors of anemia among children in District Dir Lower, Khyber Pakhtunkhwa Pakistan. Population of this study was the children who studying in primary schools. Two-stage cluster ranked set sampling method was used to identify the representative sample from the population. Schools were considered as clusters from which five schools were selected randomly. Then, from each selected school 20 children were selected for taking information. Finally, 100 children consisting 57 male and 43 male subjects were selected. Data were collected using structure questionnaire from the respondents. Anemia was diagnosed using recommended standard method. The anemia prevalence was 65% in both male/female children. While 66.7% male and 62.3% female were anemic in the study area. In order to find the significant risk factors of anemia in the study area, logistic regression model was estimated. The model shows that gender, malaria, family income and stunting were significantly affecting the prevalence of anemia. The study concluded that high percentage primary school children were anemic. Awareness in parents is vital regarding risk factors of anaemia.

Keywords: Incidence of Anemia, Malaria, Gender, Income, Stunting.

Introduction

Anemia is a major public health problem both in developed and developing countries in the world. This disease affects adversely human health as well as their economic and social development (WHO, 2002). The anemia also adversely affects growth and energy level of human. It affects cognitive and motor development of children (Baker & Greer, 2010). Anemia is prevalent in all age groups particularly in young children in the developing world (Kassebaum, 2014). Globally, over 273 million children under age five are suffered from anemia (WHO, 2011). The developing countries have higher percentage of anemic children, approximately 39% and 48% incidence in children under and above five years old (WHO, 2001). Anemia affects mostly poor population's health in developing and underdeveloped countries, like Pakistan, India, and Bangladesh (WHO, 2008).

Assefa et al. (2014) conducted study in prevalence and risk factors of anemia in school children in Ethiopia. They found 37.5% school children suffer from anemia. Moreover, their study reveals that low family income, mothers' education, intake of plant food, and intake of animal food were the factors associated with anemia in children. Latif et al. (2018) conducted a study in Gwadar to determine the frequency of anemia in children. Their study showed that 64.6% children (62.9% male and 65.9% female) were anemic in the study region which were very higher. Akhtar et al. (2017) found prevalence of anemia in various age group of children in Lahore, Pakistan. They found 66.66% anemic children in age group 1–3-year, 44% anemic in 4–6-year age group, whereas, age group 7-9 and 10-12 have 38.88% and 37.18% anemic children, respectively. Habib et al. (2016) found 33.2% prevalence of anemia in Pakistani children. Moreover, they found low age, stunting, anemic mother, household food insecurity, living in a rural area, being a female child were significant factors affecting prevalence of anemia.

Some studies on incidence of diseases were conducted in district Dir Lower (Ullah et al., 2009; Ahmad et al., 2015; Akhtar et al., 2016). We believe that very few studies are conducted on the anemia and its causes among children in Pakistan especially in Khyber Pakhtunkhwa province. This

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was the first study carried out in Dir Lower which determine the percentage of anemic children. This study conducted with the following objectives,

- To estimate the percentage of anemic school children in study area using advance sampling technique two-stage cluster ranked set sampling.
- To model the prevalence of anemia and its associated risk factors
- To investigate the significant risk factors of anemia in school children.

We used ranked set sampling scheme for selection of subjects from population.

Material and Methods

Sampling design and Estimation

This study was conducted in primary schools of district Dir Lower from October 2021 to May 2022 after taking permission from the parents of the children. In order to select more representative sample from the population, two-stage cluster ranked set sampling method was used, for detail see (Ozturk, 2019). The cost of testing each subject for anemia is costly therefore two-stage cluster RSS method was used. This method utilizes ranking technique which is cost effective.

The ranked set sampling method (RSS) was developed by Mclntyre (1952) which then modified by many researchers. For detail of RSS see Samawi et al. (1996), Amiri et al. (2015), Sevinc et al. (2018), Khan & Ismail (2019).

The procedure of two-stage cluster RSS method can be described as, in first stage select clusters (schools) using simple random sampling method. In second stage, from each cluster (school) randomly drew n^2 subjects. These subjects were distributed into n groups each of size n. The subjects within each group were ranked with respect to severity of anemia by its symptoms, without doing any test of anemia. Then, we selected the lowest ranked anemic subject from the first set, second lowest anemic subject from the second group, the procedure was continued until 'n' anemic subjects from n^{th} group were selected.

The logistic regression model was used in order to identify the significant risk factors of anemia. The reason behind using logistic regression model was the dependent variable was nominal i.e. either a subject is anemic or not.

Diagnostic method

The individuals can be ranked according to their hemoglobin level through a careful observation of (i) heart rate (ii) sore or swollen tongue (iii) breathlessness, or trouble catching a breath (iv) Jaundice, or yellowing of skin, eyes, and mouth (v) slow or delayed growth and development. These factors were used for ranking the individual from non-anemic to sever anemic. Finally, to diagnose the anemia, a medical team consisting of local physicians were hired. The anemia was diagnosed in children using standard method (Boule Medical AB, Spanga, Sweden).

Results

Five primary schools from district Dir Lower were selected using two-stage cluster ranked set sampling method. Total of 500 children were identified by SRS method from which 100 were finally selected for actual screening using RSS method.

The incidence of anemia in the selected sample was 65% (n=65). In male incidence of anemia was 66.7% (n=38) and in females was 62.3% (n=27).

Demographic characteristics of subjects are shown in Table 1. The Table shows that 60 (60%) subjects are suffer from stunning, and 55 (55%) from Malaria. Further, the 20 (20%) of subject have family income from Rs. 5000 to Rs. 30000, 55(55%) have Rs. 30001 to Rs. 50000, and 25 (25%) have Rs. 50001 or more.

Table 1. Demographic characteristics.

Variable	Group	Sample	%	Anemic Subjects
Gender	Male	57	57.00%	38 (66.7%)
	Female	43	43.00%	27 (62.7%)
Stunning	Male/female	60	60.00%	51 (85%)
Malaria	Male/female	55	55.00%	38 (69%)
Family Income	5000—30000	20	20%	15 (75.00%)
	30001-50000	55	55%	45 (81.81%)
	50001 and above	25	25%	5 (20.00%)

The result of logistic regression model shown in Table 2, which indicates that malaria, children stunning, gender and income were significant factors for incidence of anemia. The coefficient of malaria, children stunning, gender is positive related to dependent variable. While income is negatively associated to incidence of anemia. Thus, high income family have low chances of anemic children and vice versa.

Table 2 Fitted parameter estimates of logistic regression model with covariates malaria, children stunting, gender and family income with standard errors and p-values.

	Coefficient	Standard Error	P value
Constant 1	6.122	0.930	0.030
Constant 2	8.531	0.993	0.020
Malaria	0.72	0.009	0.002
Children Stunting	1.431	0.366	0.040
Gender	1.291	0.285	0.001
Income	-0.322	0.020	0.000

Discussion

The incidence of anemia among children is very high in Pakistan; especially children belonging to low socioeconomic group mostly suffer from this disease.

In our study, malaria was significantly contributed to the problem of anemia (p=0.002). This result is match with the previous study that malaria is risk factor of anemia (Marcelline et al., 2015; McElroy et al., 2000; Hotez et al., 2007; Mast et al., 2010).

Stunting was significantly associated with incidence of anemia (p=0.04). Our finding is similar to other studies (Magalhaes and Clements, 2011; Awasthi et al., 2003). This study further reveals that anemia was prevalent more in male than female (p=0.001). This result is similar to Ngesa and Mwambi (2014) who found that male is more likely to suffer from anemia than female. We also find that the incidence of anemia decreases with increasing income of family (p=0.000). This result is similar to Al-Zain (2009).

Conclusion

This study investigated the incidence of anemia, and factors affecting its incidence among school children. The study found higher incidence rate of anemia in children. Gender, malaria, income and children stunting were found the significant risk factors of anemia among children. We recommended that the risk factors found in this study should be mange by parents, government and teachers. Awareness in public regarding anemia in the study area is necessary for controlling its negative effects. This study can be extended by increasing sample size of children in the study area.

References

Ahmad, T., Zohaib, M. D., Zaman, Q., Saifullah, M. A. J., Aryal, S., Pandey, S. & Muhammad, R. (2015). Prevalence of tuberculosis infection in general population of district Dir (lower) Pakistan. *Middle East J Sci Res*, 23(1), 14-7.

Akhtar, R. I. Z. W. A. N., Shams, M. U., Hanifi, A. N., & Waheed, A. B. D. U. L. (2017). Prevalence of Anaemia in Children Under 12 Years: A one year study in a Tertiary Care Hospital, Lahore. *Pak J Med Health Sci*, *11*(4), 1353-6**.**

Akhtar, S., Khan, Z., Rafiq, M., & Khan, A. (2016). Prevalence of type II diabetes in District Dir Lower in Pakistan. *Pakistan journal of medical sciences*, 32(3), 622.

Al-Zain, B. F. (2009). Impact of socioeconomic conditions and parasitic infection on hemoglobin level among children in um-Unnasser Village, Gaza strip.*Turkish J Med Sci.*, 39(1), 53–8.

Amiri S, Modarres, R. & Bhoj D. S. (2015). Ranked set sampling with random subsamples. *Journal of Statistical Computation and Simulation*, 85(5), 935-946.

Assefa, S., Mossie, A., & Hamza, L. (2014). Prevalence and severity of anemia among school children in Jimma Town, Southwest Ethiopia. *BMC hematology*, *14*(1), 1-9.

Awasthi, S., Das, R., Verma, T., & Vir, S. (2003). Anemia and undernutrition among preschool children in Uttar Pradesh, India. *Indian Pediatrics*, *40*, 985-990.

Baker, R. D. and Greer, F. R. (2010). Committee on Nutrition American Academy of Pediatrics. Diagnosis and prevention of iron deficiency and iron-deficiency anemia in infants and young children (0-3 years of age). *Pediatrics*, 126(5), 1040-50.

Habib, M. A., Black, K., Soofi, S. B., Hussain, I., Bhatti, Z., Bhutta, Z. A., & Raynes-Greenow, C. (2016). Prevalence and predictors of iron deficiency anemia in children under five years of

age in Pakistan, a secondary analysis of national nutrition survey data 2011–2012. *PloS one*, *11*(5).

Hotez, P. J., Molyneux, D. H., Fenwick, A., Ottesen, E., Ehrlich Sachs, S., & Sachs, J. D. (2006). Incorporating a rapid-impact package for neglected tropical diseases with programs for HIV/AIDS, tuberculosis, and malaria: a comprehensive pro-poor health policy and strategy for the developing world. *PLoS medicine*, *3*(5), 576-584.

Kassebaum, N. J., Jasrasaria, R., Naghavi, M., Wulf, S. K., Johns, N., Lozano, R., et al. (2014). A systematic analysis of global anemia burden from 1990 to 2010. *Blood*, 123(5), 615–24.

Khan Z. & Ismail M. (2019). Ratio-type Estimator of Population Mean Based on Ranked Set Sampling. *Pakistan journal of Statistics and operation research*, 15(2), 445-449.

Latif. M., Ayaz. S., Manzoor. M. & Ishaq. M. (2018). Frequency and severity of anemia in children less than 15 years of age at Gwadar development authority hospital, Gwadar, Baluchistan. *Pak Armed Forces Med J*, 68 (5), 1088-92.

Magalhaes, R. J. S, Clements, A. C. (2011). Mapping the risk of anaemia in preschool-age children: the contribution of malnutrition, malaria, and helminth infections in West Africa. *PLoS Med*, 8(6). 1-16.

Marcelline, U., Umulisa, N., Munyaneza, T., Karema, C., Maniga, J. & Barugahare, J. B. (2015). The impact of malaria and Gastointestinal Helminthiasis co-infection on Anemia and severe malaria among children in Bugesera District, Rwanda. *Inter J Trop Dis Health*, 13(4):1–7.

Mast, D. Q., Syafruddin, D., Keijmel, S., Riekerink, T. O., Deky, O., Asih, P. B., ... & van der Ven, A. J. (2010). Increased serum hepcidin and alterations in blood iron parameters associated with asymptomatic P. falciparum and P. vivax malaria. *haematologica*, *95*(7), 1068–74.

McElroy, P. D., ter Kuile, F. O., Lal, A. A., Bloland, P. B., Hawley, W. A., Oloo, A. J. & Nahlen, B. L. (2000). Effect of Plasmodium falciparum parasitemia density on hemoglobin concentrations among full-term, normal birth weight children in western Kenya, IV. The Asembo Bay Cohort Project. *The American journal of tropical medicine and hygiene*, *62*(4), 504-512.

Mclntyre, G. A. 1952. A method for unbiased selective sampling, using ranked sets. *Australian Journal of Agricultural Research* 3(4), 385-90.

Ngesa, O. & Mwambi, H. (2014). Prevalence and risk factors of anemia among children aged between 6 months and 14 years in Kenya. *PLoS One*, 9(11), 1-10.

Ozturk, O. (2019). Two-stage cluster samples with ranked set sampling designs. *Annals of the Institute of Statistical Mathematics*, *71*(1), 63-91.

Samawi, H. M., Ahmed, M. S., & Abu-Dayyeh, W. 1996. Estimating the population mean using extreme ranked set sampling. *Biometrical Journal* 38(5), 577-586.

Sevinc B., Gurler S. & Cetintav B. (2018). Partial groups ranked set sampling and mean estimation. *Journal of Statistical Computation and Simulation* 88, 1-12.

Ullah, S., Jan, A. H., Wazir, S. M. & Ali, N. (2009). Prevalence of cutaneous leishmaniasis in lower Dir District (NWFP), Pakistan. Journal of Pakistan Association of Dermatologists, 19, 212-215.

World Health Organization. (2011). The global Prevalence of anemia in 2011. Geneva: Retrieved on July 2022 from https://apps.who.int/iris/bitstream/handle/10665/177094/9789241564960_eng.pdf

World Health Organization. (2001). Iron deficiency anemia: assessment, prevention and control A guide for program managers. https://www.who.int/publications/ m/item/iron-children-6to23--archived-iron-deficiency-anaemia-assessment-prevention-and-control.

World Health Organization. (2002). The World Health Report 2002. https://www.who.int/ publications-detail-redirect/9241562072.

World Health Organization. (2008 ediwdlWor .Prevalence lobal WHOg : 2005-of anaemia 1993 gli andes EEdited by Bruno de Benoist, Erin McLean, In / .database on anemia .organization World Health Mary Cogswell.https://apps.who.int/iris/handle/10665/43894