A Systematic Review -Prevalence and management of anemia among school children in Tajikistan

Prof. Dr. Ajoke Akinola, HOD, Public Health Department, School of Nursing and Health Sciences, Noida International University.

Prof. Dr. N.H Simon, Director of School of Nursing and Health Sciences, Noida International University UP-India.

Mamlakat Zevarshoeva, MPH Student, Public Health Department, Noida International University.

Abstract

Background:

Anemia is one of the significant public health problems that influence the world's complete population widely. Anemia is known to influence individuals having a place with all age-gatherings, especially women of child bearing age furthermore, children. World Health Organization (WHO) definitions for anemia are as per the following: in children from a six month to 5 year, anemia is characterized as a Hb level <11g/dl, and in children between 5–11 years Hb < 11.5 g/dl.

Methodology

In this systematic literature review the methodological nature of the chose investigations was evaluated with explicit criteria's. I played out a methodical hunt of electronic writing (PubMed and Google scholar) to audit all investigations as indicated by my chose point.

Results:

Figure 1 shows the details of both the selected and excluded studies. The database search retrieved a total of 14200 titles (4190 from google scholar and 10 from PubMed). After removing duplicates, titles remained, and 6200 titles were considered for abstract screening. After excluding a further 6050 articles based on their abstract, 150 articles were considered for full-text review of which 20 met the inclusion criteria.

Conclusion:

Despite the fact that anemia has been identified as global public health problem for several years, no rapid progresses has been observed and the prevalence of the disease still high globally. The WHO and the United Nations International Children Fund (UNICEF) have stated that there is an immediate need to reduce the prevalence of anemia, and the importance of identifying its numerous etiology, in order to ascertain effective control and preventive programmes (WHO, 2004).

Keywords: Prevalence, management, anemia, children

INTRODUCTION

Background:

Anemia is one of the significant public health problems that influence the world's complete population widely. Anemia is known to influence individuals having a place with all age-gatherings, especially women of child bearing age furthermore, children. World Health Organization (WHO) definitions for anemia are as per the following: in children from a six month to 5 year, anemia is characterized as an Hb level <11g/dl, and in children between 5–11 years Hb < 11.5 g/dl. [1]

It represents a significant public health problem prompting an expanded danger of child mortality. Moreover, anemia has negative outcomes on intellectual turn of events and physical development of children from early stages through to adolescence. It damage immune systems, also, is related with expanded morbidity rates. In any case, because of the deceptive nature of its introduction, mellow to-direct degrees of anemia habitually stay undetected and untreated by medical care workers.

It is assessed that almost 50% of all cases of anemia are because of iron inadequacy, while other reasons for anemia are multifactorial and incorporate parasitic diseases and dietary insufficiencies [2].

Anemia is a condition where in the number and size of red blood cells, or the hemoglobin centralization of red blood cell (RBCs) falls under a set up cutoff esteem, therefore hindering the limit of the blood to move oxygen around the body (WHO 2015).

Globally

According to WHO, Anemia is a major public health problem and one of the most regular dietary problems worldwide has significant ramifications for human wellbeing, financial and social turn of events.

Anemia is the most widely recognized medical issue in the world. It influences around 305 million young children worldwide. It is assessed that about half of worldwide anemia is because of iron deficiency.[3]

Although a few examinations have demonstrated a decline in the prevalence of anemia in the previous thirty years, anemia is as yet the most well-known healthful issue due primarily to iron deficiency in earliest stages, adolescence, what's more, pregnancy. According to the current WHO information, anemia is generally frequent in South Asia and Africa with the highest prevalence in West Africa. The prevalence of anemia is most noteworthy in children of 1–5 years old achieving 50–60 percent of the populace in creating nations and 10–20 percent in industrialized ones .[6]

In Tajikistan

Undernutrition in Tajikistan stays critical, with the main Tajikistan Demographic Wellbeing Survey (DHS) in 2012 finding that 26% of children <5 were hindered from persistent unhealthiness, 10% were squandered (showing intense unhealthiness), and 12% were underweight. Micronutrient inadequacy is widespread (Statistical Agency under the President of the Republic of Tajikistan [SA], Ministry of Health [Tajikistan], and ICF International, 2013).

Prevalence of anemia among both children 6–59 months furthermore, reproductive age women is 26%, and middle urinary iodine content levels are 87.5 µg/l among children <5 and 75.0 µg/l among reproductive age women, far below the edge of 100 µg/l (Ministry of Health Republic of Tajikistan, 2018).[9]

Objectives

1. To evaluate the prevalence of anemia among schoolchildren in Tajikistan

2. To determine the various risk factors associated with anemia in school going children

3. To understand the pattern and approach to treatment of anemia among school children.[11]

Method and Material

In this systematic literature review the methodological nature of the chose investigations was evaluated with explicit criteria's. I played out a methodical hunt of electronic writing (Pub Med and Google scholar) to audit all investigations as indicated by my chose point. All recovered articles were freely screened dependent on rules built up a priori. To recognize qualified imminent investigations distributed in English up to 2020 among 150 articles the 20 articles chosen which were covering my examination destinations and met my consideration criteria's. Prevalence and management of anemia among school children was utilized as an authentic subject in web indexes.

Study selection and data extraction

The selection criteria for inclusion after reviewing the article used population-based studies which reported the prevalence of anemia among school children, using English language were included. The principle result of interest was prevalence of anemia utilizing the WHO model for anemia. Tajikistan school-age children were considered as study population (7–18 years of age). Studies were excluded if they were not primary studies (such as review articles, conference abstract, editorials). [12]

Inclusion criteria:

- The articles that covers objectives of the related topic.

- The articles that were performed by English language

- Children in the age group of 7 Years to 18 year

- Those children with hemoglobin level less than 11 gm/dl;[13]

Exclusion criteria:

- Studies were excluded when individuals studied were younger than 7 years,

- Study population were adults not children

- where the full content was not accessible in English,

- Studies with no clear study design and methods[13]

Results

Figure 1 shows the details of both the selected and excluded studies. The database search retrieved a total of 14200 titles (14190 from google scholar and 10 from PubMed). After removing duplicates, 12150 titles remained, and 300 titles were considered for abstract screening. After excluding a further 11850 articles based on their abstract, 150 articles were considered for full-text review of which 20 met the inclusion criteria.

The study results emphasized the high prevalence of anaemia among all the age groups of children.[14]

Age of the study population

20 articles were conducted on prevalence and management of anemia. 12 studies were conducted on school children. Meanwhile, 8 studies conducted in the hospitals.All school children were aged between 7 to 18 years.

Tools and instruments:

Interview guides and structured Questionnaire were the most widely used research tools in the studies, five studies conducted on private companies and most of the studies done in public, private, teaching hospitals and schools.
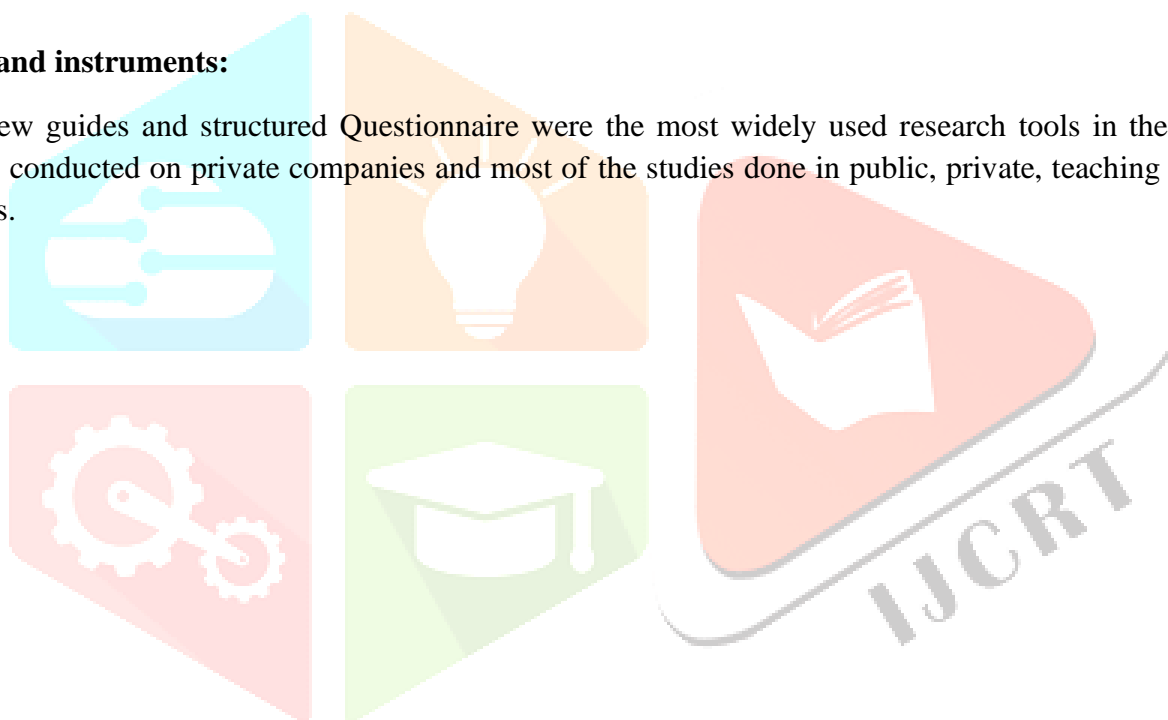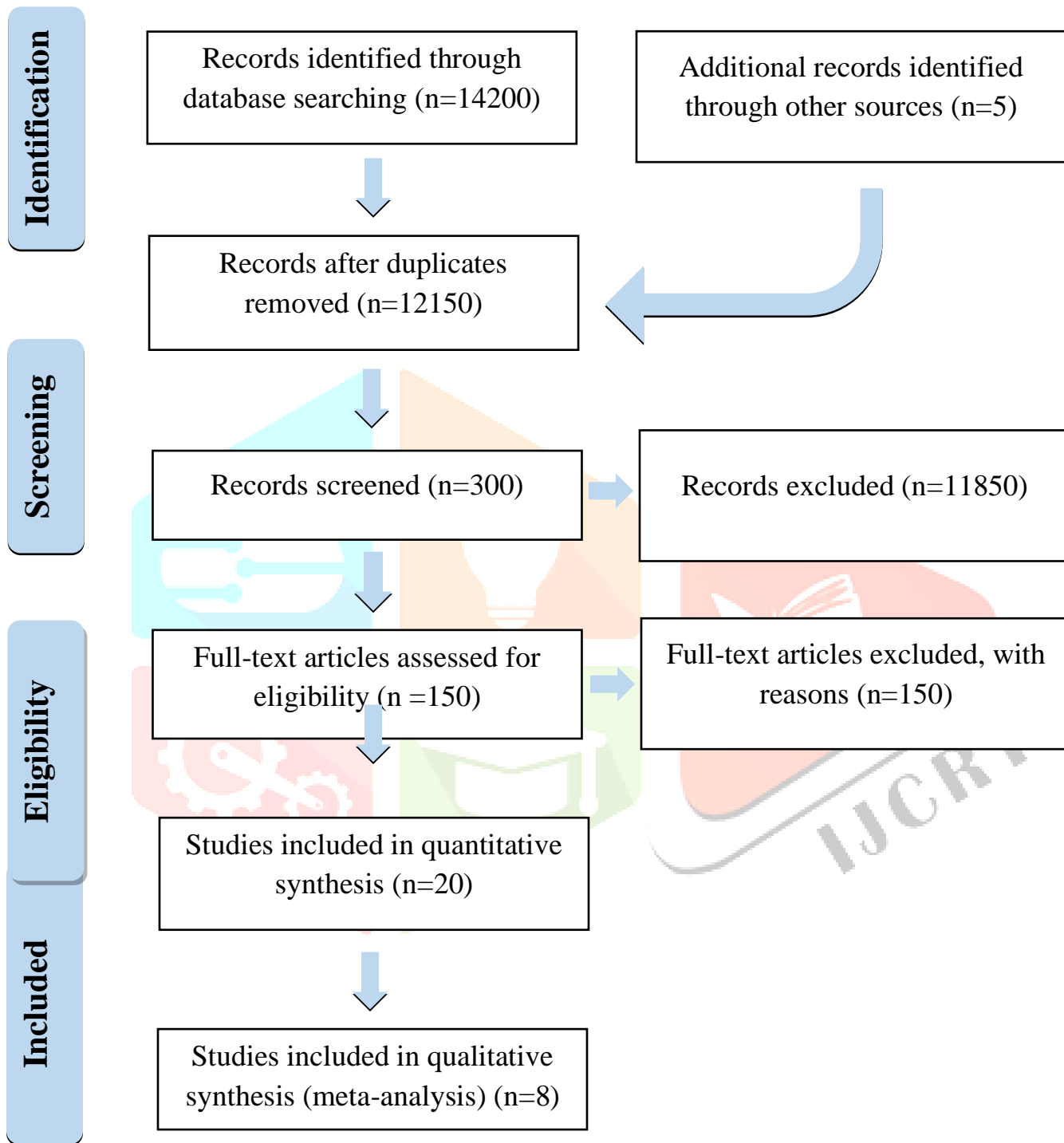
Figure 1: PRISM**PRISMA TABLE**

Identification

Records identified through database searching (n=14200)

Additional records identified through other sources (n=5)

Records after duplicates removed (n=12150)

Screening

Records screened (n=300)

Records excluded (n=11850)

Eligibility

Full-text articles assessed for eligibility (n =150)

Full-text articles excluded, with reasons (n=150)

Studies included in quantitative synthesis (n=20)

Included

Studies included in qualitative synthesis (meta-analysis) (n=8)

PRISMA Diagrammatic Explanation for the Systematic Literature Review [15]

Name of author (s)/ Year of publication/ Country study was conducted	Age of children	Aims and Objectives	Methodology	Result	Conclusion
[16]Navinkumar Angadi1, Balu PS22019/ DavangereKarnataka, India	(11-15 years) of adolescent girls	To control anemia, diet management mainly for school children in the field practice area of JJM Medical College, Davangere.	A Longitudinal study with Pretest–Posttest Design was led in the provincial field practice region of JJM Medical College among 175 young adult school young girls.	The prevalence of anemia at the baseline was 38% and it reduced to 26% at the end of one year intervention. The mean hemoglobin concentration was increased by 0.37gm/dl.	Weekly Iron and Folic acid supplementation and regular deforming programme was beneficial to reduce the prevalence of anemia and to improve the mean hemoglobin level of the adolescent girls.
[17]Robel Tezera, Zekariyas Sahile2018/ Ethiopia	(5–17 years of age) of children	To synthesize the pooled prevalence of anemia in school-age children in Ethiopia.	Far reaching looked was led in PubMed/MEDLINE, Cochrane Library, Google Scholar, HINARI, and Ethiopian Journal of Health Development for examines distributed before 2016	The pooled prevalence of anemia among school children in Ethiopia was 23%.	Because of the difficulties of anemia for school children, safeguard arranging and control of iron deficiency among school children in Ethiopia is important.
[18] Lucía Iglesias Vázquez,Edith Valera/2019/Latin America	school-age children (6–12 years)	This efficient survey and meta-investigation planned to assess the prevalence of anemia in this populace.	Defined investigations were performed utilizing RevMan5.3 to appraise the general prevalence of anemia in preschool and school children.	The quantity of anemic children was 32.93% and 17.49%, individually, exhibiting a huge distinction as per age (p < 0.01).	National surveys should include school-age children. Further nutritional interventions are required to control anemia.
[19]Bikila Dereje Fufa, BSc, MSc and Habtamu Gutema, BSc 2019/South West Ethiopia	5-9 years of children	To assess the prevalence of anemia and associated factors among Children attended at Jimma Medical Center, South West Ethiopia.	Data was gathered by eye to eye interviews via prepared information authorities utilizing pretested organized questionnaire.	From the total observed children 55 (26%) had mild anemia, 31 (14.6%) had moderate anemia and 9 (4.2%) had severe anemia.	The prevalence of anemia has connection with ignorance of moms, decreased family pay intestinal sickness and loose bowels of kids

[20] Sarvepalli Vijaya Kumar Krishnan Ramalingam 2019/ India	6-15 years of age school going children	Estimating the prevalence of intestinal parasitic infections and focused on iron deficiency anemia among the tribal school going children.	A prospective study for one year was led at a tertiary consideration emergency clinic and study bunch was ancestral children from inns and schools.	Presence of anemia in the current investigation populace was 11.21% and among the examination bunch with parasitic contaminations it was 66.67%.	To conclude, regular deworming practices, awareness regarding hand washing practices, iron and folic acid supplementation irrespective of nutritional status
[21]Margaret Mary Tohouenou 2019/Ghana, Africa	school children 4 – 8 years	To survey the prevalence of anemia, low nutrient A level and anthropometric dietary status of 162 arbitrarily chose youthful Ghanaian school children	The study setting was chosen by basic arbitrary testing	One hundred and sixty-two children out of 172 parents and children who consented to participate in the study provided biological (blood and stools) samples.	Anemia and vitamin-A deficiency exist as issues of public health importance among the study participants.
[22] Safii Nik Shanita,Awal Siti Hanisa/2018/Kuala Lumpur, Malaysia;	Children 7 to 12 years	This study is aimed at assessing the management of anemia in school children and explore the associations among socio-demographic characteristics,	Using data from the South East Asian Nutrition Surveys (SEANUTS), 544 Malaysian children aged 7 to 12 years	Approximately one-third of the children were classified as overweight (14.1%) or obese (18.8%), while only 4.8% were classified as stunted	Low prevalence of anemia and ID among primary school-going children aged 7 to 12 years in Malaysia.
[23] Azab Elsayed Azab 2020/ Western Libya, Afica	aged between 5 and 14 years	To assess the prevalence of iron deficiency anemia among school children in Sabratha in Western Libya.	Stratified random sampling method covering the four topographical zones of Sabratha was utilized.	Of the 711 screened school children 11.08% males and 12.90% females were anemic (Hb)	Interventional health education programs should be conducted in schools to highlight the risk factors of anemia
[24] Jun-Yi Wang1 , Pei-Jin Hu12020/China	children aged 7, 9, 12, and 14 years old	To assess the geographic disparity in anemia and Identify the drugs used in management of anemia among school-aged children in China.	Anemia, iron deficiency seriousness, and hindering were characterized by WHO definitions.	Strategic relapse showed that the hindering youngsters have 30% higher danger of iron deficiency than non-hindering children after change for age, sex and school	Specific guidelines and interventions are required, particularly for juvenile young girls and the gatherings with genuine anemia trouble.
[25] Jinghuan Wu , Yichun Hu 2019/China	children and adolescents aged 6–17 years	To evaluate the prevalence and anemia status of Chinese children and adolescents from the Chinese National Nutrition and Health Survey	Data of children and adolescents aged 6–17 years were obtained from CNNHS 2010–2012, which was the same survey as that reported in Li et al	Post-hoc analysis showed that sex distribution in children aged 6–8 years was significantly different from those aged 9–11 years (p = 0.006)	Further research is required to understand the determinants of iron status, which could then lead to procedures to ease iron inadequacy for Chinese youngsters and teenagers

[26] Zhaogeng Yang, Yanhui Li 2020/ China	9-14 years old children	To estimate the prevalence of anemia among 9- 14-year old Chinese children and explore the related components of iron deficiency.	Data come from a cross-sectional overview directed in 26 areas and 4 regions in territory China.	A total of 8.4% of members were recognized as being iron deficient; and the prevalence was higher in girls and country children.	Intervention projects of adding egg and milk into school every day diet may add to diminishing iron deficiency in Chinese school aged children
[27] Djamila L. Ghafuri , Shehu U. Abdullahi 2019/Africa	A aged 5–12 years	To estimate the prevalence and risk factors of anemia among school children and assess the health and nutritional status of children.	Led a cross-sectional investigation of 850 children with SCA matured 5–12 years of age living in the low-asset setting of northern Nigeria.	Between July 2016 and July 2017, an aggregate of 850 children with SCA were evaluated for the SPRING preliminary in Nigeria, of which 799 had total anthropometric qualities at pattern and were remembered for the last investigation	for older children with SCD living in Nigeria, applying the WHO reference for defining severe malnutrition overestimates the proportion of children with severe malnutrition
[28]Oluwaremileku n G. Ajakaye Mojirayo R. Ibukunoluw 2020/Nigeria, Africa	children up to 10 years old	Evaluating the prevalence and risk factors for malaria infection, anemia and malnutrition among children living in internally displaced persons (IDP) camp in Edo state, Nigeria	Anemia and malnutrition were defined according to World Health Organization standards.	Malaria infection and anemia were recorded for 55.2% and 54.0% of the children,	Anemia and malnutrition control should be integrated with existing malaria control and should include children above five years of age
[29] Zhonghai ZhuChristopher R. Sudfeld 2019/China	10-14 years of children	Asses the prevalence and associated factors of anemia among young children in rural western China	Anemia was dened by World Health Organization standards. Logistic regression was used to examine the risk factors for anemia.	The overall prevalence of anemia was 11.7% (178/1517). Female adolescents were 1.73 (95% CI 1.21, 2.48) times bound to have iron deficiency when contrasted with males.	Nutritional and social determinants were identied as predictors, warranting interventions to reduce the risk of anemia among this critical age group.
[30] Ayele Gebeyehu Chernet , Teklu Nega,Mohammed Derese Biru 2019/Ethiopia	5-12 years of children	To determine the prevalence of mild, moderate and severe anemia, and the associated factors among children in Ethiopia	The data was obtained from 2016 Ethiopia Demographic and Health Survey which is the fourth overview	The highest prevalence of anemia among children observed in Somali (17.8%) and the lowest percentage that was recorded in Addis Ababa (3.1%).	The female children, rustic children, children from helpless family, and having low weight are identified with the seriousness of anemia.

[31]Emad Tahir & Pierre Ayotte 2020/Quebec, Canada	children and adolescents (3 to 19 years	To characterize anemia and ID prevalence and associated protective and risk factors among First Nations children in Quebec.	The 2015 First Nations pilot study was led among children (3 to 19 years; n = 198) from four First Nations people group in Quebec.	The prevalence of anemia and ID was raised (16.8% and 20.5% separately) Traditional meat, organic product, and organic product juice (regular and powdered)— by means of their positive relationship with nutrient C admission—were the solitary food factors emphatically connected with SF	Vitamin C, which is known to upgrade iron assimilation, and battling aggravation could add to diminish the high prevalence of anemia and ID in this youthful Indigenous populace.
[32]Varun Arjun2019/ Uttar Pradesh Region, India	among 2-12 years of aged children	To assess the prevalence, severity, risk factors of anemia among 2-12 years of aged children attending a hospital.	Blood and feces tests were gathered from the patient. Among those children with hemoglobin	A total of 138 males 62.7% were having hemoglobin less than 11.4 gm. /dl indicating anemia.	Anemia was slightly more prevalent in girls of the same age group as compared to boys.
[33] Rosfazlina Roslie1 , Aza Sherin Mohd Yusuff2019/ Kudat, Sabah Malaysia	aged between 8 to 10 years	The objective of the study was to diagnose the present prevalence of anemia and the association with probable risk factors among school children.	This cross-sectional study was done from August 2017 to February 2018 among 261 school children, who matured between 8 to 10 years in Kudat, Sabah, were chosen through straightforward arbitrary testing.	Out of 82 weak children, a day and a half experiencing iron lack anemia.The BMI status, the presence of soil-transmitted helminths and level of knowledge regarding IDA had highly significant (p	By improving the household economy, education, sanitation, and personal hygiene status what's more, advancing steady dietary training among the populace may assist with diminishing the prevalence of IDA.
[34]Caroline Katharina Stiller 2020/India	7-12 years of children	The extent of child undernutrition (conventional and composite index of anthropometric failure (CIAF) classification), as well as the burden of anemia in children and its management	Presented baseline data were obtained in the scope of a prospective longitudinal feeding trial lasting for 1.5 years,	Every second child was found to be hindered (51.9%) or underweight (49.2%), and each fifth child experienced moderate or extreme squandering (19.0%).	Procedures to battle childhood anemia and under nutrition at a practical level need to guarantee youngster's dietary enhancement and an improved admittance to preventive medical services, to handle both iron inadequacy and contamination.

[35]Milli Dutta Mahadev Bhise 2020/India	6-10 years	Estimating the prevalence of anemia and associated risk factors at individual and community level in India among children	Descriptive statistics and the chi-square test were applied using fourth round of National Family Health Survey dataset.	The outcomes show that a few parts of the local area impact the anemia risks of children.	Prerequisite to incorporate local area level components past the individual level elements by policymakers to destroy the weight of anemia in the country and the high prevalence states

Study setting

Of the 20 articles which met the inclusion criteria around 5articles (n=5) were conducted in India the ages of 2-19 years. Fourarticles (n=4) were conducted in China, children were 6-17 years old, while 4 articles (n=4) were conducted in Africa children were between 4 – 14 years. Threearticles (n=3) were conducted in Ethiopia where the age of children was between 7-17 years old. Two articles were conducted in Malaysia the age of 8-10 years. Only 1 article from Canada where children were the age of 3-19 years and 1 article were conducted in America the age of 6-12 years. (Fig.2).
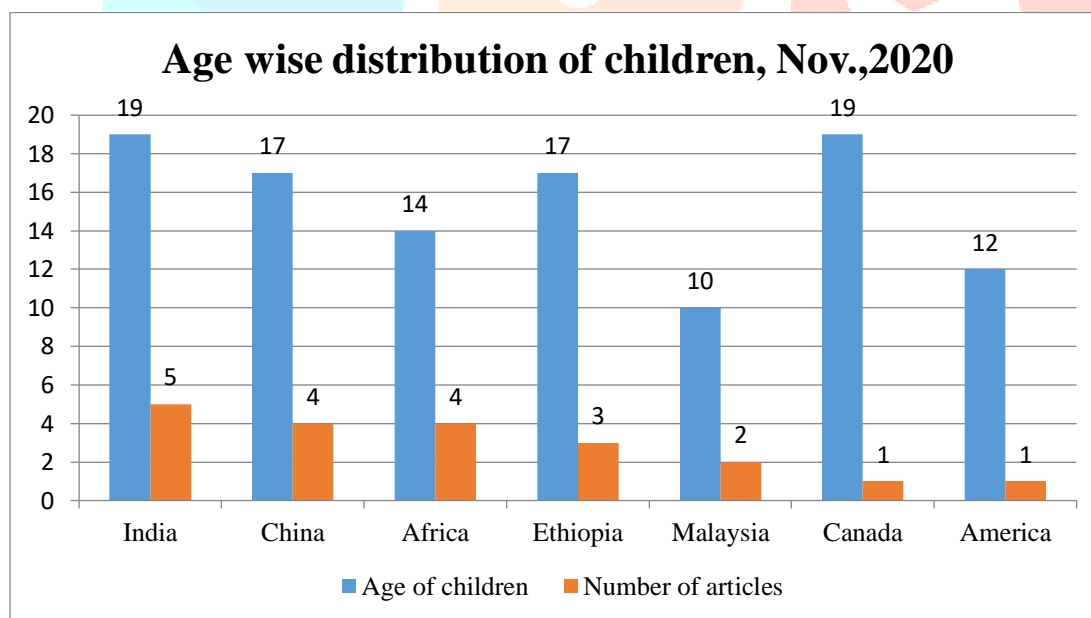

Figure 2:Age wise distribution of children

Discussion

The primary purpose of the present study was to evaluate the prevalence of anemia and determine the various risk factors associated with anemia among schoolchildren by reviewing the findings of available studies. (4)As indicated by this survey, sickliness was a significant general medical issue for all populace remembered for this investigation. [18]

Anemia is the result of a wide variety of causes and wellbeing determinants that frequently coincide together. Iron deficiency is the most widely recognized reason prompting to anemia, but infectious diseases such as malaria, worm infestation and schistosomiasis, deficiencies of other essential micronutrients and socioeconomic factors such as maternal education and low household income; are likewise significant determinants of anemia, especially in this kind of contexts. [29]

Similar to other studies, such differences found in our study might be because of the dietary intake of iron among rural communities and aboriginal children as well as the differences in food practices among other ethnic groups. In this study, the prevalence of anemia and ID was higher among children from low pay families and the individuals who were slim/ordinary weight, in spite of the fact that the outcomes were not measurably critical. ID has been related with the country region and low family unit pay where another study of rural children in Malaysia also detailed comparative discoveries [22].

As indicated by WHO, anemia is a general medical condition just when the prevalence exceeds 5% of the population. The WHO grouping for mild, moderate, and severe is the point at which its prevalence surpasses 5, 20, or 40%, separately. As per the WHO definition, five articles reported mild prevalence of anemia, two articles reported moderate prevalence of anemia, and only one article reported severe prevalence of anemia.

The prevalence of anemia was differing from 5.83 to 43.7%. The highest prevalence of anemia was reported in 2019 in America (45%). The smallest prevalence was reported in 2020 among school children in China (8,4%).[16]

The increased risk of anemia in children below the age of 12 years is reliable with discoveries from different nations. This weakness is perhaps because of the increased requirement for iron at this improvement stage of a child and the lacking presentation of iron-rich food subsequent to weaning. [22]

Overall, the prevalence of anemia was essentially higher in girls than in boys, and also there was low prevalence of anemia in regions with good economic conditions. However, a few districts, for example, the more unfortunate country setting of Group VII and working class urban areas of Group III may be overlooked.[26]

In the present study, we found that girls and rural children had lower hemoglobin concentration and a higher prevalence of anemia, which was steady with a study conducted in India. One potential explanation might be due to the difference in pubertal development between boys and girls, as girls lose blood during menstruation and in this manner have a higher necessity for hemoglobin and iron. Understanding factors associated with anemia can give more knowledge to the measures that can be applied to combat anemia. In the current study, we found that overweight and obese children were less likely to have anemia, which was reliable with a study conducted by Harding, Kassandra, although other studies had recognized both positive. Moreover, we additionally found that children who consume eggs and milk each day had a lower risk of anemia. [12]

The school children were chosen in this study because it is regarded as being the most vulnerable groups to iron deficiency and anemia.

As per this review, anemia was a significant general medical condition for all population remembered for this study. The outcome was similar with systematic review conducted in India (Some of the included countries are China, Ethiopia, and America). The systematic review reported that the majority of the articles reported moderate prevalence of anemia. [20]

Conclusions

Despite the fact that anemia has been recognized as global public health problem for several years, no rapid progresses has been noticed and the prevalence of the disease still high globally. The WHO and the United Nations International Children Fund (UNICEF) have expressed that there is an quick need to reduce the prevalence of anemia, and the significance of recognizing its various etiology, to learn viable control and preventive projects (WHO, 2004).

It was established that occurrence of anemia is directly related with parents' income and maternal literacy status, malaria and diarrhea of children. Subsequently, poverty alleviation and improving the economic status of the society is an essential system to decrease the prevalence of anemia. General adult education to parents and health education to the community are also important strategies to reduce the burden of anemia [3].

Moreover, by improving the household economy, education, sanitation, and personal hygiene status and promoting consistent nutritional education among the population may help to reduce the prevalence of anemia [17].

The interstate contrasts noticed may direct the wellbeing organizer to change the techniques for control of anemia in poor performing countries. A powerful procedure is expected to make the wellbeing training meetings for pregnant women and school children. It is essential to raise the level of awareness by all potential ways with the help of Media, TV, and health campaigns by Government as well as Non Government Organization at network premise, so it can reach to entryway step of every family uniquely school children. It is additionally significant that by the help of National Social Services (NSS) unit these awareness programmers be conducted in all educational institutions. [24]

REFERENCES

1. Chacko, Ranjith, et al. "Knowledge, Attitude and practices of anemia among pregnant women in a Government hospital." *Indo American Journal of Pharmaceutical Research* 6.11 (2016): 6988-6992.

2. Ncogo, Policarpo, et al. "Prevalence of anemia and associated factors in children living in urban and rural settings from Bata District, Equatorial Guinea, 2013." *PloS one* 12.5 (2017): e0176613.

3. Bhojan, Chitra. "Research Article Study on Prevalence of Anaemia among School Children in a Rural Community Setup." (2014).

4. Feleke, Berhanu Elfu, et al. "Burden and determinant factors of anemia among elementary school children in northwest Ethiopia: a comparative cross sectional study." *African journal of infectious diseases* 12.1 (2018): 1-6.

5. Amarasinghe, Gayani Shashikala, et al. "Factors associated with anemia among Sri Lankan primary school children in rural North Central Province." *BMC pediatrics* 17.1 (2017): 87.

6. Gür, Emel, et al. "Prevalence of anemia and the risk factors among schoolchildren in Istanbul." *Journal of tropical pediatrics* 51.6 (2005): 346-350

7. Barduagni, Paolo, et al. "Performance of Sahli and colour scale methods in diagnosing anaemia among school children in low prevalence areas." *Tropical Medicine & International Health* 8.7 (2003): 615-618.

8. Klassen, Ann C., et al. ""Then you raise them with Shirchoy or cookies": Understanding influences on delayed dietary diversity among children in Tajikistan." *Maternal & child nutrition* 15.2 (2019): e12694.

9. Keskin, Y., et al. "Prevalence of iron deficiency among schoolchildren of different socio-economic status in urban Turkey." *European journal of clinical nutrition* 59.1 (2005): 64-71.

10. Harding, Kassandra L., et al. "Determinants of anemia among women and children in Nepal and Pakistan: An analysis of recent national survey data." *Maternal & child nutrition* 14 (2018): e12478.

11. Rusmawatiningtyas, Desy, et al. "Early detection of anemia among school children using the World Health Organization Hemoglobin Color Scale 2006." *Paediatrica Indonesiana* 49.3 (2009): 135-8.

12. Muthayya, Sumithra, et al. "Low anemia prevalence in school-aged children in Bangalore, South India: possible effect of school health initiatives." *European journal of clinical nutrition* 61.7 (2007): 865-869.

13. Basu, Sabita, et al. "Prevalence of anemia among school going adolescents of Chandigarh." *Indian pediatrics* 42.6 (2005): 593.

14. Dharmalingam, A., et al. "Cross sectional study on nutritional status and prevalence of anemia in rural adolescents." *International Journal of Contemporary Pediatrics* 4.3 (2017): 951-5.

15. Sop, Marie Modestine Kana, et al. "Risk factors of anemia among young children in rural Cameroon." *Int J Curr Microbiol App Sci* 4.3 (2015): 925-935.

16. Angadi, Navinkumar, and P. S. Balu. "Effectiveness of Weekly Iron and Folic Acid Supplementation Programme to Control Anemia among Rural Adolescent School Girls of Davangere, Karnataka." (2019).

17. Tezera, Robel, et al. "Prevalence of anemia among school-age children in Ethiopia: a systematic review and meta-analysis." *Systematic reviews* 7.1 (2018): 80.

18. Iglesias Vázquez, Lucía, et al. "Prevalence of anemia in children from latin america and the caribbean and effectiveness of nutritional interventions: Systematic review and meta–analysis." *Nutrients* 11.1 (2019): 183.

19. Fufa, B. D., and H. Gutema. "Prevalence of Anemia and Associated Factors among Children Attended at Jimma Medical Center, South West Ethiopia." *Int Arch Nurs Health Care* 5 (2019): 129.

20. Kumar, Sarvepalli Vijaya, and Krishnan Ramalingam. "Intestinal parasitic infections and prevalence of anaemia among tribal school going children: a one year study." *International Journal of Contemporary Pediatrics* 6.5 (2019): 1893.

21. Tohouenou, Margaret Mary, et al. "Anaemia, vitamin-A deficiency, anthropometric nutritional status and associated factors among young school children in Kodzobi, Ghana, a peri-urban community." *African Journal of Food, Agriculture, Nutrition and Development* 19.2 (2019): 14483-14499.

22. Nik Shanita, Safii, et al. "Prevalence of Anaemia and Iron Deficiency among Primary Schoolchildren in Malaysia." *International journal of environmental research and public health* 15.11 (2018): 2332.

23. Jbireal, J. M., and Azab Elsayed Azab. "Prevalence of Iron Deficiency Anemia among School Children in Sabratha, Western Libya." *Archives of Hematology and Blood Diseases* 3.1 (2020): 26-43.

24. Wang, Jun-Yi, et al. "Reducing Anemia Among School-Aged Children in China by Eliminating the Geographic Disparity and Ameliorating Stunting: Evidence From a National Survey." *Frontiers in Pediatrics* 8 (2020): 193.

25. Wu, Jinghuan, et al. "Prevalence of anemia in Chinese children and adolescents and its associated factors." *International journal of environmental research and public health* 16.8 (2019): 1416.

26. Yang, Zhaogeng, et al. "Prevalence of Anemia and its Associated Factors among Chinese 9-, 12-, and 14-Year-Old Children: Results from 2014 Chinese National Survey on Students Constitution and Health." *International Journal of Environmental Research and Public Health* 17.5 (2020): 1474.

27. Ghafuri, Djamila L., et al. "World Health Organization's Growth Reference Overestimates the Prevalence of Severe Malnutrition in Children with Sickle Cell Anemia in Africa." *Journal of Clinical Medicine* 9.1 (2020): 119.

28. Ajakaye, O. G., and M. R. Ibukunoluwa. "Prevalence and risk of malaria, anemia and malnutrition among children in IDPs camp in Edo state, Nigeria. Parasite Epidemiol Control. 2020; 8: e00127."

29. Zhu, Zhonghai, et al. "Prevalence and Associated Factors of Anemia Among Adolescent Girls and Boys at 10-14 Years in Rural Western China." (2020).

30. Chernet, Ayele Gebeyehu, Teklu Nega, and Mohammed Derese Biru. "Prevalence and Associated Factors of Anaemia severity among Children in Ethiopia."

31. Tahir, Emad, et al. "Anemia, iron status, and associated protective and risk factors among children and adolescents aged 3 to 19 years old from four First Nations communities in Quebec." *Canadian Journal of Public Health* (2020): 1-12.

32. Pathak, Sunjay, and Radesh Pathak. "Assessment of the Prevalence, Severity, Risk Factors of Anemia Among 2-12 Years of Aged Children Attending a Hospital in Western Uttar Pradesh Region."

33. Roslie, Rosfazlina, Aza Sherin Mohd Yusuff, and M. Tanveer Hossain Parash. "The Prevalence and Risk Factors of Iron Deficiency Anemia among Rural School children in Kudat, Sabah."

34. Stiller, Caroline Katharina, et al. "Prevalence of Undernutrition and Anemia among Santal Adivasi Children, Birbhum District, West Bengal, India." *International Journal of Environmental Research and Public Health* 17.1 (2020): 342.