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RESEARCH ARTICLE

Prevalence of iron deficiency (anemia) in human population of district Bannu Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Iron Deficiency Anemia (IDA) remains a significant global health challenge. This study critically evaluates recent articles published within the last 18 months, focusing on strategies for diagnosing and managing this pervasive condition. Iron deficiency constitutes a primary driver of anemia, with its higher prevalence in developing nations. Notably, the district of Bannu in Pakistan experiences a more pronounced burden of iron deficiency due to factors such as malnutrition and poverty. This study centers on Bannu to address this concern. A cohort of 200 blood samples underwent pathological testing, with 110 (55%) being male and 90 (45%) female. Of these, 120/200 (60%) were positively diagnosed with IDA. This form of anemia is categorized into three types based on decreasing hemoglobin levels: Mild Anemia (10-10.9g/dl, 41.66%), Moderate Anemia (7-9.9g/dl, 37.5%), and Severe Anemia (<7g/dl, 20.83%). The dataset comprised 100 observations from various hospitals in Bannu, revealing a higher prevalence of anemia in females due to factors like heavy menstruation and malnutrition. The study underscores the persistent prevalence of IDA in District Bannu, particularly among school-age children, where the anemia rate was notably high (60%). Common symptoms include skin and eye pallor, brittle fingernails and toenails, as well as additional manifestations like headaches, dizziness, fatigue, weakness, and breathlessness. In conclusion, this research sheds light on the ongoing challenge of IDA in District Bannu, reflecting a substantial anemia burden among school-age children. The study emphasizes the need for comprehensive interventions to combat IDA and its associated symptoms, aiming to enhance the overall well-being of the affected population.

Introduction

Iron deficiency, a common nutritional disorder, poses a significant global public health concern due to its detrimental impact on human well-being. Among its various manifestations, anemia stands out as a prevalent consequence of inadequate iron intake or absorption [1]. Anemia, characterized by a decreased level of hemoglobin in the blood, can lead to reduced oxygen-carrying capacity, diminished energy levels, and impaired cognitive function. While iron deficiency anemia affects populations worldwide, its prevalence is particularly noteworthy in certain regions [2]. One such region is District Bannu, located in the Khyber Pakhtunkhwa province of Pakistan. This district, like many others in low and middle-income countries, faces complex challenges related to health, nutrition, and socio-economic factors, which collectively contribute to the persistence of iron deficiency anemia [3]. Diagnostic indicators of iron deficiency anemia involve a range of tests and markers that collectively provide insights into the body's iron status. These include measurements of hemoglobin levels, hematocrit, mean corpuscular volume (MCV), and serum ferritin concentration [4] Low hemoglobin and hematocrit values suggest decreased oxygen-carrying capacity, while a reduced MCV indicates smaller red blood cells. Serum ferritin, a crucial iron storage protein, reflects the body's iron stores; low levels signify

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depleted reserves. Additionally, transferrin saturation and red cell distribution width (RDW) measurements offer valuable information [5]. Comprehensive analysis of these indicators aids clinicians in accurately diagnosing and managing iron deficiency anemia, promoting timely intervention to mitigate its effects [6].

Understanding the prevalence and factors contributing to iron deficiency anemia in the human population of District Bannu is essential for designing effective intervention strategies and public health initiatives. This study aims to assess the prevalence of iron deficiency anemia in District Bannu, Khyber Pakhtunkhwa, Pakistan, and explore its underlying causes within the context of local socio-economic, dietary, and healthcare-related factors. Such insights could pave the way for targeted interventions to improve the overall health and well-being of the population in this region.

2. Marital and Methods

2.1 Research area

The district of Bannu exhibits a higher prevalence of iron deficiency compared to the rest of Pakistan, primarily attributed to prevailing malnutrition and poverty. This rationale underscores my decision to focus on Bannu when addressing this issue. Within this context, it becomes evident that females in Bannu experience a higher incidence of anemia compared to males, primarily due to factors such as heavy menstrual cycles. Meanwhile, the prevalence of anemia among males can be attributed to the inadequate access to essential nutrients, including sources like red meat and a diverse range of vegetables, with the overarching factor being poverty.

2.2 Sampling

A total of 200 samples were gathered from school-going children, spanning the age range of 6 to 12 years. These collected samples were subsequently transported to the laboratory for further analysis.

2.3 Samples preparations;

The collected samples underwent laboratory preparation to determine the presence of iron deficiency. Subsequently, the blood tests were promptly transported to Amir Medical Lab in Bannu. Utilizing a hematology analyzer, we performed an analysis that encompassed parameters such as hemoglobin (HB), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and platelet count. Notably, a reduced MCV value can indicate the occurrence of microcytic hypochromic anemia.

2.4 Data collected from hospitals

A dataset comprising 100 entries was compiled from hospitals such as KGN and MTI. The data encompassed a diverse age range, spanning from 15 to 60 years, and was also categorized by gender. Subsequently, the collected information was subjected to analysis using Microsoft Excel.

3. Results

A comprehensive study involved interviewing and clinically assessing a total of 200 children, aged between 6 to 12 years, encompassing both genders - males and females - in the Bannu region to determine the prevalence of iron deficiency. Following the clinical evaluations, blood samples were meticulously collected for subsequent in-depth analysis. This investigation entailed the processing of 200 blood samples for iron deficiency anemia (IDA), with 110 samples (55%) being from males and 90 samples (45%) from females, as indicated in Table 1.

Table 1: Gender vise distribution of Total patients Positive and Negative cases.

Gender	Total No.	Positive	Negative	Percentage (%)
Male	200	90	110	55%
Female	200	110	90	45%

Out of the total 200 cases, 120 (60%) were identified as instances of iron deficiency anemia (IDA). Among these cases, 85 (70.8%) were females, while the remaining 35 (29.1%) were males, as outlined in Table 2.

Table 2: male and Female Iron Deficiency Anemia (IDA)

Total IDA patient:	120/200
Females	85/120
Males	35/120

Iron Deficiency Anemia (IDA) can be categorized into three distinct types based on hemoglobin levels, each reflecting varying degrees of severity. These classifications include: Mild Anemia: Hemoglobin levels ranging from 10 to 10.9 gm/dl, accounting for 41.66% of cases. Moderate Anemia: Hemoglobin levels falling between 7 and 9.9 gm/dl, constituting 37.5% of the cases. Severe Anemia: Characterized by hemoglobin levels below 7 gm/dl, making up 20.83% of the cases. These categorizations are presented in detail in Table 3.

Table 3: Mild, Moderate and Severe cases of Hemoglobin vise distribution of IDA patient.

Degree of anemia	Males	Females	Total
Mild:(10-10.9gm/dl)	33	17	50
Moderate:(7-9.9gm/dl)	35	10	45
Severe:(<7gm/dl)	17	8	25

Within the cohort of IDA patients, those aged less than 6 years accounted for 50 out of 120 cases (41.6%). Among individuals aged between 6 and 12 years, there were 40 out of 120 cases (33.3%), while those above 12 years constituted 30 out of 120 cases (25%), as illustrated in Table 4.

Table 4: Age wise Iron Deficiency Anemia patient

Age gp in year:	IDA patient	**Percentage (%)**
<06years	50/120	41.6
06-12years	40/120	33.3
>12years	30/120	25%

The study reveals that out of the total 100 individuals examined, 65% were female and 35% were male, all of whom were affected by iron deficiency in the Bannu district (Figure 1).

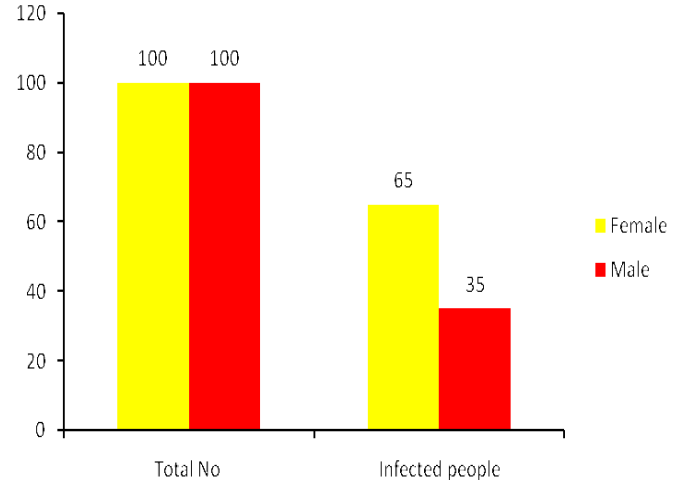

Figure 1: shown the percentage of the infected people of iron (Hemoglobin) deficiency.

The data illustrates that 14.66% of individuals exhibit mild Hemoglobin deficiency, 37.55% are classified as moderate cases, and 20.83% are identified as severe cases in the Bannu district (Figure 2). In the rural areas, a significant proportion of patients, comprising 63% females and 37% males, were affected by iron deficiency. Conversely, in the urban areas of the Bannu district, the prevalence of iron deficiency was observed in 47% of females and 45% of males (Figure 3).

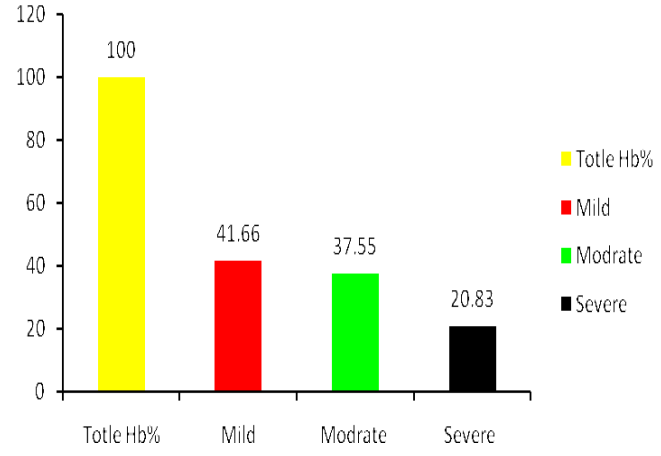

Figure 2: shown the status of the Hemoglobin cases in district Bannu.

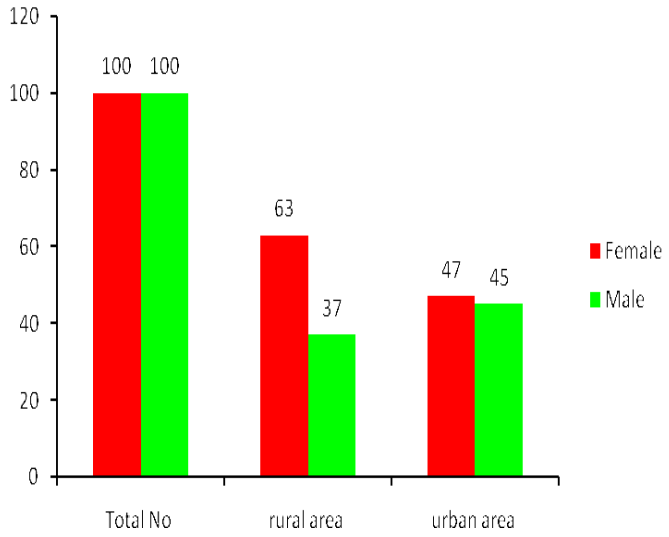

Figure 3: shown the percentage of the infected people of iron deficiency.

4. Discussion

Iron deficiency frailty inside early life moreover has a huge length over outcomes, sure as much hindered physical yet mental blast or improvement also so diminished physical wellness, work limit, and staff execution [6]. Iron destitution weakness is characterized by method of the WHO standards concerning grant Hb esteem agreeing after age: Hb< 11.5 g/dL in 6e11 years chronicled youngsters; Hb< 12 g/dL of 12e15 years old kids; or 15e18 years recorded no pregnant females; and Hb< thirteen g/dL of 15e18 years old guys [7]. The current assessment depended upon 200 young juvenile connecting from 05 to 12years incorporated the two genders (Male and female) nearby Bannu. Sickliness is one of the broad clinical issues among youths and pregnant women particularly in making nations. In Kpk (Pakistan) the paleness of IDA occur in Bannu. The degree of iron deficiency in replacements of two sexual courses (age 05_12years) was 60% in Bannu territories Bannu. The whiteness rate in this age was high considering the way that the youths require reviving eating routine for brisk new development. In Africa the paleness in children is (60%), eastern Mediterranean (63%), south Asia (66%) latin America (46%), and North America(7%) [8].

In 1990-1994 that diatery paleness in children under the age of 05years were (62.9%)by the national prosperity audit for Pakistan(NHSP). In Punjab unavoidability of paleness among urban area is (51.5%) [9]. In the young ladies IDA was high (42.5%) when contrasted with young men (17.5%) in region Bannu, on the grounds that a large portion of the guardians want to male kids when contrasted with female youngsters [10]. The current examination the regularity of iron lack was high in youngster (42.5%) between the regional more youthful understudies of Bannu than youthful fellows. The unavoidability of sickliness was high in teenagers 51.1%among the urban more vigorous understudies of Punjab than young people close to 05 years and 10-20 years age. In Southern India in Banglore, trustinwhite youth (15.3%) differs from that of young workers (12.0%). The low enormity in Bangalore was an

eventual outcome of the school based mediation program that have been driven 2003[11].

The level of frailty was high in age gatherings (10 - 10.9) 41.6% and in (7-9 years) 37.5% kids when contrasted with age gatherings (> multiyear) 25% kid on the grounds that at this age the kids body requires balance nourishment for fast development. In Pakistan the youngsters are conceded in school at 05 years old years. At that age, there are more weights on kids and need more sustenance. As per age astute appropriation; the predominance of paleness was high (48%) at age 09 - 12 years in India and 15.5% in 05 - 08 years child [12]. The level of Mild frailty (Hb 10 to <11 g/dL) (46.8%) in youngsters was high trailed by moderate (Hb 7 to <10 g/dL) (45.5%) and extreme iron deficiency (Hb< 7 g/dL) (12.6%). The level of mellow frail (11.2%), moderate pallid (2.1%) and serious sickly were (0.3%) in young offspring of Bangalore which was like the current investigation. Mellow weakness > Moderate frailty > Sever sickliness [6].The objective of this investigation was to assess the incidence of anemia among pregnant women in district Faisalabad. Anemia during pregnancy remains a prevalent clinical concern, exhibiting high prevalence rates (ranging from 35% to 75%) across numerous developing countries (WHO, 1992). Within this context, diverse regions have exhibited varying prevalence rates, including 88% in India, 86% in Tanzania, 47% in Nigeria, 74% in Indonesia, 48% in the Philippines, and 47% in Bangladesh [13]. In this present study, an assessment of the blood profiles of 100 pregnant women revealed that 75% of them exhibited anemia, while the remaining 25% were non-anemic. Our findings align closely with those reported in Lahore, where 80% of pregnant women were anemic, and the remaining 20% were non-anemic [11]. This consistency in results suggests a notable trend of anemia among pregnant women across different geographic areas and underscores the persistent challenge of addressing anemia's prevalence during pregnancy.

5. Conclusion

It is closed from the current examination that the issue of iron deficiency was high in young youngsters. The level of weakness among young kids was high (60%) in locale Bannu. It implies that the weakness was more predominant in country district than in urban territory. In kids the nearness of paleness diminishes insusceptibility, physiological development and decreases physical and mental exercises. The level of weakness was higher in young ladies (42.5%) than young men (17.5%). As indicated by age-wise, 10 - 12 years kids were increasingly weak. A large portion of the kids were mellow iron deficient. The indications of paleness were hard to distinguish and analyze however the Pale skin was the most widely recognized side effect of pallor.

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Authorship contribution statement

Muhammad Kumail Khan, Hira Nawaz, Laiba Faraz, Farishta Zafar, and Sana Gull: Conceptualization, Data curation, Validation, Visualization. **Jawad Ullah, and Masood Rehman**: Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Danish Saleem**: Data curation, Formal analysis, Investigation. **Muhammad Safwan and Imam Ud Din**: Data curation, Formal analysis. **Saira Abbas**: Writing – review & editing, Supervision, Resources, Project administration.

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