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Original Research Article

Analyzing the Prevalence of Iron Deficiency Anemia: A Study on Children under Five at Bay Regional Hospital in Baidoa, Southwest State of Somalia

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Abstract: ***Background*:** Like many countries in the low-income, underdeveloped world, a large number of people in Somalia suffer from anemia, an illness that massively endangers the lives of children and pregnant women. Yet, there is paucity of reliable scholarly studies that discuss anemia and iron deficiency related diseases in the country. In particular, the district of Baidoa in the Southwest State of Somalia, shares a lot of this lack of scholarly work that commonly exists in other parts of the country. Living in a complex situation of acute poverty, and a stubborn cycle of drought, famine and floods, Baidoa has a huge number of children severely affected by malnourishment and types of anemia caused by iron deficiency. ***Objective*:** This study aims to shed light on the prevalence of iron deficiency anemia among children under 5 years who visited Bay Regional Hospital for treatment in the year 2020 and their condition after undergoing treatment for the required or recommended period of time for recovery from the illness. ***Method*:** The study used quantitative case study method of observation of existing archival materials accessed at Bay Regional Hospital in Baidoa District, Southwest State of Somalia. It used data compiled on a sample size of 94 children under age 5 who were anemia patients admitted and treated in the hospital in the year 2020. ***Results*:** Of the 94 under age 5 child patients, 84% were cured, 5.4% were recorded as defaulters who absconded before completion of the prescribed treatment period, 9.6% needed special care and were referred to a specialized health institution for further treatment, while 1% succumbed to the disease. ***Conclusion*:** Although IDA is prevalent among children in Baidoa, particularly as revealed in the current study on child patients admitted at Baidoa District's Bay Regional Hospital, the effort by parents, medical professionals, health authority, donors and other stakeholders to fight the disease is yielding laudable results. With more awareness and attention by the stakeholders, there exist opportunities to further decrease the impact of the IDA ailment on children and others who are prone to the illness.

Keyword: Anemia, Baidoa, iron deficiency, iron deficiency anemia (IDA), malnutrition, poor diet, Southwest State of Somalia.

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I. INTRODUCTION

Iron deficiency Anemia (IDA) in children is a well-known public health problem and has a serious effect on the health and growth of children. It causes child morbidity and mortality and harms the cognitive/mental development of children. The Ministry of Health of the Federal Government of Somalia with other institutions (MoH FGS *et al*., 2020:6) report that "The national prevalence of ID in children (47.2%) and non-pregnant women (49.7%) is relatively high." The report reveals that there is however a remarkable decrease in ID in that "Compared to the survey in 2009,

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the prevalence is more than 20% percentage points lower in children [although]... almost 20% percentage points higher in women."

In particular, the report indicated that "28.6%" of the surveyed children were suffering from IDA (MoH FGS *et al*., 2020:4). Medical and scientific research has given evidence to the negative effect of anemia to the brain of infants and children. In view of taking great awareness toward the impact of anemia on children, a section of scholars raise a needed public alert acknowledging that: "the brain is the most vulnerable organ during critical periods of development, including the last trimester of fetal life and the first 2 years of childhood, which are the period of rapid brain growth termed as 'brain growth spurt"' (Hermoso *et al*., 2011).

According to rsearchers, anemia is not an illness of the poor alone as it affects even people in developed countries. For instance, experts revealed that in the US close to 8% of infants suffer from iron deficiency while 2-3% have iron deficiency anemia (Roganović and Starinac 2018; Brotanek *et al*., 2008). However, when comparing poor and rich countries of the world, Roganović and Starinac (2018, p. 48) maintian that "IDA is approximately seven times more frequent" to affect people in developing nations with poor diet lacking in red meat than their counterparts in either Europe or North America.

Bay Regional Hospital in Brief

Bay Regional Hospital (BRH) is one of the colonial projects that were implemented in the country. It was built in 1936 by the Italian colonial administration (Abdinor *et al*., 2021). It is the main referral hospital in Baidoa and serves as a main health facility for a lot of people in the neighboring regions of Bakool and Gedo. It receives technical and financial support from various organization including MSF, ICRC and other International Non-Governmental Organizations (Yarow *et al*., 2021). These organizations play a very significant role in running the hospital activities. Therefore, as the main health facility in the region, BRH serves not only the district of Baidoa but the entire region of Bay, and by far, the Southwest State and Somalia in general.

The International Committee of the Red Cross (ICRC) supports the Surgical Department, Emergency Department, and the ICU while it also aids the facility with funds and medical equipment and supplies critically needed by the numerous patients who seek medical assistance from the hospital. The Médecins Sans Frontières (MSF) aids most of the hospital's needs and covers expenses toward the Maternity Department, Department of Pediatrics, the Department of Neonatal Care, the Laboratory, the Security Unit, and the Out-Patient Department of the Antenatal Care (ANC). There are two pharmacies that deal with the dispensary of medical prescriptions issued by doctors in the above-mentioned departments. Because patients who visit the hospital are poor and among the most vulnerable in the society, the hospital provides all prescription medicines free of charge.

II. LITERATURE REVIEW

Characteristics of Iron Deficiency Anemia (IDA)

Iron deficiency anemia is a common type of anemia — a condition in which blood lacks adequate healthy red blood cells which carry oxygen to the body's tissues. As the name implies, iron deficiency anemia occurs as a result of insufficient iron in the body (https://www.mayoclinic.org/). Without adequate iron, the body cannot produce the sufficient amount of red blood cells needed to enable it to carry oxygen through the body. The indication is that when iron is insufficient in the human body it can create several illnesses resulting from the vulnerabilities ensuing the deficiency. In particular, IDA can cause fatigue and tiredness, among other conditions, and makes the person feel short of breath, and may be treated with iron supplementation that can help the person recover.

In fact, among the various types of anemia, IDA is considered as the most common type. Iron deficiency, though serious and can cause health problems, Benoist *et al*., (2008) state that a patient suffering from the illness can ease symptoms of this type of anemia by adding iron to their diet. Iron deficiency anemia has for a long time been among child health problems most widely spread in countries in Sub-Saharan Africa, according to Hall *et al*., (2001). Furthermore, Hall *et al*., (2001, p. 749) indicate that anemia stands among the major problems school-age children in sub-Saharan Africa face. The scholars estimate that over 40% children in the African countries they studied have been found to be suffering from anemia which contributed to children's late enrolment into schools.

Iron deficiency anemia is an illness commonly known to cause weakness, deteriorate physical growth of the child, and affect the immune system by minimizing the capability to encounter and fight against infections, consequently increasing morbidity that may lead to child mortality (Horton and Ross, 2003). In fact, Horton and Ross (Ibid) state that iron deficiency anemia is even capable of damaging a child's cognitive ability and performance as well as potentially causing delay to his/her "psychomotor development" (Horton and Ross 2003). The authors further mention that iron deficiency anemia has implications on the economy as it costs around 4% of GDP in under-developed nations, affecting child school attendance and learning and possibly contributing to the extension of poverty from generation to the other in under-developed countries.

Importance of Iron

Iron is one of the minerals found in the soil, rocks, and is available in the earth. It is a very useful mineral to the human body and its function. Iron is a major element of the hemoglobin, a very useful protein which is known to produce the red blood cells that carry oxygen through the human body. In the case that an iron deficiency situation occurs in the body of a child, the hemoglobin decreases, which essentially indicates that the concerned child is suffering or starts suffering from symptoms of anemia and that the child needs attention. The impact of IDA is felt because iron is present in different parts of the human body including in the muscles, in the brain, in the liver, and other parts of the body. Thus there is possibility that children who have problem of iron deficiency anemia will suffer from other illnesses that can strike the body as a result of the deficiency (https://www.hsph.harvard.edu/).

According to Brabin *et al*., (2001), IDA is a type of what is known in the medical world as microcytic anemia when anemia itself is classified morphologically into its different types or natures. It plays a major role in causing morbidity and mortality in children in Africa (Brabin *et al*., 2001). The type of anemia caused by the deficiency of iron in the body, in other words known as iron deficiency anemia, is categorized as one of the major organic process deficiencies and is considered to be a significant cause or symptom of child malnourishment in many parts of the world (Fishman *et al*., 2000). Anemia related to malnutrition is acquired as a result of a long period of time with insufficient intake of several vitamins such as B complex, vitamin B12, iron, macromolecule and water-soluble vitamin (Fishman *et al*., 2000).

Thomson *et al*., (2011, p. 2) report in their article entitled "Nutrient Intake and Anemia Risk in the WHI Observational Study," published in the *Journal of American Diet Association*, "Inadequate nutrient intake is commonly the result of health symptoms such as poor dentition (reduced red meat consumption resulting in reduced iron and vitamin B12 intake), reduced appetite (resulting in general reduction in all nutrients) and reduced tolerance of milk products (a primary source of vitamin B12)."

Stages of Iron Deficiency Anemia

According to the Cleveland Clinic, iron deficiency anemia (IDA) is developed in three stages or phases according severity. As the website reveals, the three stages are:

- **First stage:** Iron stores are depleted. In this stage, the supply of iron to make new hemoglobin and red blood cells is dwindling but hasn't yet affected your red blood cells.
- **Second stage:** When iron stores are low, the normal process of making red blood cells is altered. You develop what's called iron-deficient erythropoiesis, sometimes called latent iron deficiency. Erythropoiesis is the medical term for the process of producing new red blood cells. In this stage, your bone marrow makes red blood cells without enough hemoglobin.
- **Third stage:** Iron-deficiency anemia develops because there isn't enough iron to make hemoglobin for red blood cells. In this stage, the hemoglobin concentration will drop below the normal range. This is when you may begin noticing iron-deficiency anemia symptoms. (https://my.clevelandclinic.org/).

On the website of the Auckland Iron Clinic is furnished another cause: "If part of your small intestine has been bypassed or removed surgically, that may affect your ability to absorb iron and other nutrients (www.aucklandironclinic.co.nz).

III. METHOD

Research Design

The study used quantitative method by investigating archival documents. Its design is based on the case study method as recommended by Eno and Dammak (2014) among other scholars. It follows observation and investigation of existing data in the custody of the institution of our focus, Bay Regional Hospital (BRH) in the district of Baidoa in the Southwest State of Somalia (SWSS). The reason for the case study method is because it provides an in-depth investigation of an individual, group, institution or phenomenon (Kothari 2017; Gerring 2007; Flyvbjerg 2006) so as to gain insights into the matter.

Geographical Scope

The study was carried out in Baidoa district in Somalia. It focuses on one hospital which is Bay Regional Hospital. The researchers' aim was to obtain a clear picture of the prevalence of cases of Iron Deficiency Anemia (IDA) patients who visited BRH in the area of study and the impact of the treatment.

Study Population

The study population consisted of 1190 children under five-years, who visited the Pediatric Department of Bay Reginal Hospital in the year 2020.

Purposive Sampling

The target population was composed of children suffering from IDA and registered in the records at Bay Reginal Hospital. The study used purposive sampling by selecting only the 94 under-age-five children registered as IDA patients in the year 2020. The number is not based on representative percentage of child patients per se but because it was conveniently manageable and provided us an opportunity to deal with one specific year. The narrow focus allowed us to deal with this one particular year and particular type of illness, hence investigating IDA among under five-year children in the year 2020 as a case on its own.

Data Collection

The study utilized observation and investigation of existing archival materials in the form of secondary data. The researchers consulted with the authority at Bay Regional Hospital for the purpose of the study, sought authorization to access data available in the hospital database as well as stored in the archival room. Permission to access was granted, allowing the researchers to study through the files and select the appropriate documents from among them. The focus was IDA patients under five years who were admitted in the hospital in 2020.

Validity and Reliability

Validity and reliability of this study were ensured by the fact that the data collected for observation and investigation was an already existing secondary data (Mohajan 2017). In other words, forms of human bias were avoided due to the reason that the original purpose of the data was not related to the current study. By doing so, problems that would arise from biases in questionnaire design or data collection procedures for primary purpose were restricted. In addition, the archival data was cross-checked with other existing files recorded and preserved according to hospital regulations. Relevance and usability of data was discussed with experts for comments and advice, with the aim of strengthening the reliability measure of the data. In certain cases, a dual data collection and cross-checking method was applied in order to counter-check and verify data in the hospital management information system (HMIS) against data entered in hospital registers upon arrival and admission of patients. This approach counter-checking was opted due to the reason that the HMIS had been recently introduced in the hospital.

Data Analysis

After identification of files and records of interest, data was coded and organized according to months, gender, recovery level, age, and nature of severity of the illness. Statistical software, particularly statistical package for the social sciences SPSS, was used in order to avoid discrepancy, although the sample size was small and figures could be manageably calculated manually. Five tables are used to present the results and discussion in simultaneity. In that respect, results are displayed in terms of frequency and percentage under categories of gender, age, monthly admissions throughout year 2020, type of anemia—whether moderate or severe, and level of recovery upon discharge.

Inclusion and Exclusion Criteria

Patients who should be included in the study and those to be excluded was determined according to age and type of disease. For instance, the study considered for inclusion only children under 5 years of age who were admitted at BRH as a result of anaemia in the year 2020. All other children who visited the hospital for any other illness and ages other than those specified were excluded from the study and were for that matter not considered to be part of the target population under study.

Ethical Consideration

The study got ethical approval from the University of Southern Somalia and Bay Regional Hospital. In that respect, names of patients were kept anonymous so as not to contravene doctor-patient confidentiality.

IV. ANALYSIS AND DISCUSSION

In this section the results and analysis of the study are presented. Data categorization is made by demonstrating the results in frequency and percentage as displayed in tables. The analysis presented here specifically investigates IDA types by singling them out as moderate and severe, which are basically the two categories Bay General Hospital deals with. This note is necessitated by the fact that there are other studies in the literature that characterize anemia into three separate types of mild, moderate and severe whereas the current study, as mentioned here, deals with only moderate and severe types of IDA.

Table 1: 2020 admissions of iron deficiency anemia by month

Month	Jan		Feb		Mar		Apr		May		Jun		July		Aug		Sep		Oct		Nov		Dec		Total	
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
No. of patients under 5	11	6	6	2	3	3	1	0	4	1	3	1	4	0	8	0	7	2	7	2	10	0	7	6	71	23
Total	17		8		6		1		5		4		4		8		9		9		10		13		94	

As Table 1 shows, data was captured from the time the new admissions started in January and children suffering from iron deficiency anemia were identified. They consisted of 17 cases of 11 male and 6 female. In February, the total number of under-five anemia admissions decreased with a total number of admissions of 8 children, 6 male and 2 females. The total number admitted in March was 6, balancing the gender as male 3 and female 3. April has turned with only 1 male case admitted for IDA under five, while during May 5 cases were admitted, an increase of 4 patients more than the previous month; with 4 male and 1 female cases. In June, 3 male and 1 female children were admitted, the same number as in July where case detection for under-five IDA was only 4, with all being male patients.

However, August recorded 8 male cases admitted, with no female admissions and therefore similar to April and July both of which have not registered female admissions. Under-five anemia

patients admitted in September were 9, with male admissions of 7 leading females of only 2. In October, anemia cases that were under five years of age admitted at BRH comprised of 9 in number where male were 7 and female 2, showing exactly the same results as in the previous month of September, while during the month of November the under-five anemia cases admitted totaled 10, with all cases reported from male patients.

During the last month of the year 2020, 7 male cases and 6 female cases were reported to close the count of the year for visitors seeking treatment for anemia. The significance of the results furnished in Table 1 is that it demonstrates an account of the increase and decrease of anemia cases across the 12 months of year 2020 where the first month, January, and the last two months of November and December recorded the highest admissions of 17, 10, and 13 respectively.

September and October both demonstrate equal number of admissions of 9 each, followed by February and August each of which has 8 IDA child patients and therefore placed in the fifth position, pushing March into the 6th and May into the 7th position in that order. June and July share the same place at position 8 with 4 admissions each, while the month of April has the lowest admission rate of only one male patient. Contrariwise, April leads the table as the best month for registering just a single patient, a scenario which would then make the sequence of the months in that order of preference and would place November, December and January as the last months in the trail of positions regarding admissions of anemia patients under five years old.

Table 2: Patients by gender

Gender	Quantity	Percentage
Male	71	75.5%
Female	23	24.5%
Total	94	100%

The total number of admitted children under five for anemia cases in 2020 was 94, with male patients numbering 71 against females of 23. Table 2 gives us a clear indication of male children exceeding the number of female children who suffered from anemia. The high number of boys, scoring 71 and confirmed in percentage as 75.5%, raises a concern of why this group is about 3 times more than the females suffering from the same illness. However, the study did not delve into whether these child patients were affected through malnutrition and improper diet or whether the illness affected them as a result of genetical problems inherited from either of the parents, as an investigation of that nature was beyond the scope of this study. Nevertheless, the results reveal that male children are almost 3 times more likely to be admitted than female children as demonstrated in the context of the current study, year and institution under investigation.

Table 3: Age of patients

Age	Number of children	Percentage
0-12 month	28	29.7%
13-24 months	38	40.5%
25-36 months	13	13.8%
37-48 months	8	8.5%
49-60 months	7	7.5%
Total	94	100%

When analyzed from the perspective of age difference, children of up to 12 months registered 29.7% and close to a third. They are overtaken significantly by children between 13- 24 months who returned a result of 40.5% and about 12% higher than their closest counterparts of 0-12 months. Children in the age range 25-36 months were 13.8% and in third place while those aged between 37-48 months returned a lower frequency rate of 8.5% among the IDA patients admitted at Bay General Hospital in 2020. The fewest admissions among the five age clusters were the oldest participants who aged between 49-60 months and produced a result of 7.5%. The least number of the 49-60 age-group gives the suggestion that possibly as children grow older, they move out of the risk bracket of anemia, which, from another angle of analysis, could mean that the risk still remains more prevalent among the younger age groups.

Table 4: Effect of medication

Result of medication	Number	Percentage
Cured	79	84%
Defaulter	5	5.4%
Referral	9	9.6%
Death	1	1%
Total	94	100%

Table 4 demonstrates a good reflection of the impact and effectiveness of Bay General Hospital's treatment of anemia which the children were undergoing. When children suffering from anemia were put on medication, according to the results furnished in Table 4, the treatment proved significant change in the child patients. According to the results, this improvement is evident from the number of children cured from the illness: 84% of the 94 patients under discussion in this study. In comparison, children with anemia who started medication but could not respond satisfactorily to the treatment and therefore referred to more specialized health facilities make 9.6% of the 94 patients under observation in this study.

Referral is recommended by the doctors for child patients who develop complications during the treatment or observed to be unable to respond well to the medication after a certain period of undergoing treatment. On the other hand, 5 children, 5.4%, were recorded in the files as defaulters. Defaulters consist of children who were admitted and have started their medication but whose parents or guardians absconded with them from the hospital without notice to the health authorities at the facility.

In fact, these could be children who were responding well to medication but whose parents or guardians felt the child has improved and, in that case, did not want to stay in the hospital despite the lack of recommendation or permission for discharge. It could also be that they felt the duration of treatment was prolonged; probably longer than they had anticipated. Or they might have other issues and duties to attend to and therefore opted to *escape* from the hospital unnoticed. On the other hand, the hospital records show that under the category of children who have undergone treatment but could not make it and, for the severity of the disease succumbed to death, stand at 1 child which literally represents 1% of the 94 children studied in the context of this research—in other words—one too many.

Table 5: Classification of anemia types

Types of anemia	6 months - 2 years		2 years - 5 years		Total	
	Number of children 0-24 months	%	Number of children 25-60 months	%	Total	%
Moderate	57	60.6	23	24.5	80	**85.1**
Severe	9	9.6	5	5.3	14	**14.9**
Total	**66**	**70.2**	**28**	**29.8**	**94**	**100.0**

Children between 0-24 months make almost 61% among patients suffering from moderate type anemia, and approximately 10% severe anemia, giving us a combined figure of nearly 3/4 of the 94 patients, but also a significant majority of 70.2% of the total. The number of children suffering from moderate anemia between the ages of 25-60 months falls comparatively at 29.8% and despite consisting of a combination of three age clusters which is one age cluster more than their counterparts of 0-24 months. The result indicates that children between 0-24 months suffered from moderate anemia more than from severe anemia, which means the illness is identified to be cured at that mild level than wait till it reached the severe stage. In comparison, 29.8% of children between 25-60 months were less affected than their younger compatriots 0-24 months in both categories of moderate and severe anemia. The disparity demonstrated in the result encourages us to believe that younger infants are more prone to IDA than older children, which raises the need for mothers to have early awareness and knowledge of the symptoms before the situation deteriorates.

V. CONCLUSION AND RECOMMENDATION

Conclusion

The study focused on an investigation of iron deficiency anemia of children under 5 years old. It presented an analysis of pre-existing archival data accessed from the hospital data base. We approached quantitative data collection and analysis methods to describe the different genders, ages, and conditions of illnesses of 94 children under the age group studied in the research. The results gave a clear indication of how children were able to recover from the illness and suffering they were experiencing after medication was started. Remarkably, 84% of the patients recovered and were cured successfully before discharge, an encouraging number that could not have been achieved without the collaboration of the stakeholders including the parents, the medical personnel, the doners, and the health authority of the Southwest State, among others.

However, we note that apart from the high percentage of recovery, almost 10% of the children were referred to a specialized treatment in another hospital while 5% defaulted the treatment, thereby discontinuing the process of medication. Furthermore, the study found a death rate of 1% among the young patients under its observation, a number which seems small but could at the same time be called 'one-too-many'. In view of the results, recommendations are given below for consideration.

Recommendations

In order to reduce the effects of malnutrition among children under five years old, the study recommends the following:

- Breastfeeding by mothers is highly recommended to help the children with the natural elements of vitamins necessary for child growth and development;
- Mothers are advised to take a balanced diet and do the same for the children;
- The SWS health authority, medical personnel, and the community need to create awareness exercises to prevent infectious and other diseases and conditions that predispose iron deficiency anemia;
- Patients/guardians are encouraged to consider the consumption of iron supplementation and other vitamins vital for child nutrition and nourishment;
- Hospital authority to have keen observation of patients/guardians absconding the ward and medication prior to completion of treatment;
- Further research is needed to cover the ailment across several or all health facilities engaged in the treatment of IDA in order to assess the magnitude of the problem in Baidoa and the Southwest State and deal with it effectively but also efficiently.

Conflict of Interest: The authors report no conflict of interest in any aspect or at any stage of the study.

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