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IRON DEFICIENCY ANEMIA;
IMPORTANCE OF IRON FORTIFIED FOOD (WHEAT) FOR PREVENTION

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ABSTRACT… Around 65% of pregnant women in South Asia suffer from IDA & in Indian sub-continent alone, the rate of developing IDA during pregnancy is 88%. Moreover anemic pregnant patients are more likely to give birth to low birth weight babies which itself is another factor adding to socio-economic burden on the whole family. The food has not been fortified for Iron, Zinc & Vitamin D & hence the prevention of anemia has not yet been achieved **Objectives**: To study Awareness of women about food fortification & prevention of IDA Vs cost for treating anemia. **Period:** August 2015-Dec 2015**. Study Design**: Observational Study. **Settings:** At Bhatti International Hospital, Kasur **Results**: Among the selected anemic women, almost half (55%) had mild anemia, while rest had moderate to severe anemia indicting that the prevalence is very common. The treatment offered was oral &/or IV Iron with blood transfusions. The cost of iv Iron therapy & blood transfusions estimates in thousands with added risks of Transfusion Reactions, allergic reactions& transmission of blood-borne diseases like HCV,HBV,HIV(AIDS)&others. The awareness level was found to be poor among these women .Only 8/60 i.e 13% had some idea about iron deficiency anemia & almost none knew about food fortifications. The insight about their own disease of IDA was also 35% (21/60) indicating that most of the women in community live with IDA without any understanding of a preventable condition. **Conclusion**: The cost & time spend to treat IDA can be minimizes creating awareness about food fortification & supplementation.

Key words: IDA –Iron Deficiency Anemia, Food fortification

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INTRODUCTION

Iron deficiency anemia is decreased red blood cell production due to low iron stores in the body. It is the most common nutritional disorder worldwide .Iron deficiency anemia leads to innumerable mortalities, maternal hemorrhage, & mortality. Complications in pregnant women with anemia results in low birth weight infants &hence increased infant mortality rate.[1] It has been estimated that about 56% of pregnant women in developing countries are anemic. South Asia & Africa are the most vulnerable regions showing the highest prevalence (40%) of IDA in all age groups except for adult males &pregnant women. Around 65% of pregnant women in South Asia suffer from IDA &in Indian sub-continent alone, the rate of developing IDA during pregnancy is 88%.[2,3,4] Not only are the pregnant &nursing women affected, but according to an estimate IDA affects females of reproductive age by 50%.[5] It means that if they ever suffer from any ailment or are about to undergo a surgical treatment or even normal pregnancy, the added burden of anemia is going to increase the cost of treatment, hospital stay & anticipated complications associated with intravenous Iron therapy &blood transfusions. According to Pakistan Demographic &Health survey 2006-2007, maternal mortality is as high as 276/100,000 as compared to 1/8000 in developed world. Amongst 89 Pakistani women, one dies of child birth complications & hemorrhage is the leading cause.[6] The severity of hemorrhage increases if the women are already anemic. Different reasons play a part in causing anemia but most importantly poor nutritional status, lack of use of fortified food, poor &adulterated diets, cultural taboos regarding different food articles, poor absorption all play part together.[7,8] All these

factors ultimately decrease Iron & folic acid stores in the body. Iron &folic acid are the basic raw materials used for building Hemoglobin reserves & hence a well oxygenated cellular environment prevails.

Along with so many other important factors in treating any disease like diagnosis, investigations, compliance, body reaction towards medications, duration of treatment, and another one is the insight or knowledge of the preventive measure & causes of disease. Although the technical aspect & core knowledge is beyond our expectations but facts like:

1. Sunlight is better for bones.
2. Fruits &fresh vegetables help fight constipation.
3. Carrots are good for eyes etc.
4. Fortified food usage.

We expect that our population will have some idea about few reasons of anemia (lack of red blood) & food helpful in preventing it. If the population has such insight, then we expect that steps at personal level should be taken for prevention of anemia way before the patient presents with severe anemia in hospital. Secondly the burden of anemia also adds to the cost, duration of treatment &post procedure recovery of the patients. Moreover anemic pregnant patients are more likely to give birth to low birth weight babies which itself is another factor adding to socio-economic burden on the whole family. Pakistan has some frightening figures regarding prevalence of anemia in women of reproductive age & infants. It has been estimated that prevalence of anemia is 83%, 78%, 85%&82.9% among pregnant women, lactating women, adolescence girls &children respectively. Several factors have been unidentified which play an important role in causing IDA like poverty, consumption of cereal based diets with low bioavailability of iron, inappropriate dietary habits, personal hygiene and lack of sanitation. (9,10). Hence if women & children together constitute 65-70% of or total population & if more than 2/3rd of them are anemic , it simply indicates that anemia is probably more common than “Common Cold”. The fact is that if anemia is prevented, a lot of our health care budget can be saved. The awareness about the causes & prevention of anemia .The usage of fortified food especially wheat is still very low ,21% in South –East Asia while the prevalence of IDA is about 51%&52% in pregnant &non-pregnant women in Pakistan. The daily use of Wheat flour in Pakistan ranges from 75g/dl to 300g/dl. There is currently no legislation in Provincial government to make the Wheat Flour fortification mandatory while the Provincial Government Food Department states that Wheat Flour Fortification should be done at the cost of consumer instead of being subsidized by the government.

Aims & Objectives

To study awareness of Food Fortification& awareness of Iron Deficiency anemia vs cost of treating IDA.

MATERIALS & METHODS

A study was conducted at Bhatti International Hospital, Affiliated Central Park Medical College, and Lahore from August 2015 to December 2015. The inclusion criterion was;

1. Women with Hb levels below 11 gldl & diagnosed to have iron deficiency anemia.
2. Only indoors patients were included.
3. All women presenting in labor & gynecology ward for operative as well as conservative management.

The exclusion criterion was:

1. Obstetrics patients with primary complains of antepartum hemorrhage, post-partum hemorrhage, Placenta previa were excluded.
2. Women with primary complain of gynecological bleedings because of fibroids, endometrial hyperplasia, ovarian malignancies, Ca Cervix, molar pregnancy, ruptured ectopic pregnancies, incomplete abortions etc.
3. Women with diagnosis of Thalassemias or sickle cell anemias.
4. Women with chronic medical illnesses of kidneys, liver, metabolic disorders etc.

Study Design

Cross-sectional observational study.

A total of 60 patients were included both

gynecological & obstetrical patients were included but majority of patients were younger women with pregnancy.

RESULTS

A total of 60 women were included in the study with age group ranging from 18-35 yrs. Their Hb levels were advised as per routine investigation during antenatal visits or in anticipation of a gynecological procedure. Women with Hb levels equal or less than 11g/dl were screened for the study. Their awareness about their low Hb levels & the iron rich food that may be helpful in treating their anemia was assessed.

The decision of treating IDA was taken according to severity of disease, patient's wishes &compliance, time needed for anticipated procedure and patient's tolerability. Some patients needed hospital admission exclusively for Iron therapy while others had prolonged hospital stay just to get either IV Iron therapy or blood transfusions. In order to achieve better Iron stores, most patients had overlapping treatments in which oral & IV Iron was also given in women with severe anemia in whom blood transfusion was also given. The depleted Iron stores were replenished with prolonged.

Most of the women had Hb levels between 11 to 10 g/dl but iron therapy was required to build the Iron stores.

Hemoglobin Levels	No. of Patients	% age
11.0 g/dl to 10.9g/dl	33	55%
10.0 g/dl to 9.1 g/dl	10	16%
9 g/dl to 8.1 g/dl	10	16%
8g/dl to 7g/dl &below	7	11%

Table-I. Hemoglobin level distribution

Awareness of Food Fortification	None	Zero%
Any information regarding anemia prevention	8/60	13 %
Awareness about their low Hb	21/60	35 %

Table-III. Awareness about Low Hb & prevention of anemia

Among the selected anemic women, almost half (55%) had borderline anemia, while rest had moderate to severe anemia indicting that the prevalence is very common. The treatment offered was oral &/or IV Iron with blood transfusions. The cost of iv Iron therapy & blood transfusions estimates in thousands with added risks of Transfusion Reactions, allergic reactions& transmission of blood-borne diseases like HCV, HBV, HIV (AIDS) & others. The awareness level was found to be poor among these women .Only 8/60 i.e 13% had some idea about iron deficiency anemia & none knew about food fortifications. The insight about their own disease of IDA was also 35% (21/60) indicating that most of the women in community live with IDA without any understanding of a preventable condition. Hence if Hb level has to be raised from 9 to 11g/dl, Rs 2000 will be spent for oral iron to raise Hb + double the amount to restore the Iron reserves along with other management cost borne by the patient & family. Hence out of 188,00000,if 50% are female & again if 50% are anemic, hence an amount of 28billion would be spend just to raise Hb of women of reproductive age by 1gm/dl ,while the anemic males & children are still not included.

DISCUSSION

Pakistan has World's highest maternal mortality rate of 276/100,000. Pakistan is unlikely to meet the Millennium developmental goals of in maternal &child health by 2015 which is to achieve the maternal mortality of 140/100,000 live births.[6] Ante

Treatments	No. of patients	Cost (Rs) / per pt/1gHb rise	Hospital stay(6hrs&>)
Oral Iron only	22	300-500 Rs	Not prolonged (38 pts)
Oral & Injectables Iron	22	1400-3000	Prolonged (total 22 pts)
Injectables & Blood transfusion	10	1500-4000	Prolonged
Oral Iron & Blood transfusions	6	3500-4500	Prolonged

Table-II. Average cost /gm raise in HB

& Post-partum Hemorrhage is one of the leading causes of death among the pregnant women. Although the maternity service availability plays the pivotal role in directly preventing maternal deaths but the improvement in general health of women & improved Hemoglobin levels will definitely give a better margin of safety when dealing with hemorrhage .Naturally a woman with Hb of 9 & below will have less safety margin than woman with better Hemoglobin levels (11g/dl &above) About 64% of the women come for antenatal examinations after 20-24 weeks & by that time the requirements of Hb exponentially increases. Hence the pregnant women are left with less time to improve Hb & especially if they are poorly compliant or have gastrointestinal upsets.

In survey done by Population services, Pakistan, intake of Iron (tablets or syrup) is only 45% & out of which 46% women are between 20-34 as compared to 38% of women aged 35-49.[6] This indicates that older women who are multipara & already anemic pay less attention to their health. They are more vulnerable to develop anemia related complications. The causes of anemia needs to be assessed as IDA is the effect & the actual cause may be dietary deficiencies, worm infestations, prolonged & chronic blood loss from gynecological or GI causes with overlapping of these reasons. In rural areas of Pakistan where the diagnostic facilities are not available, the diagnosis & treatment of anemia becomes difficult &delayed.

The incidence of anemia as studied by Shahani in rural population of Sindh showed that 71% of the pregnant population were anemic &out of which 58% had mild anemia, 10% had moderate anemia & 2.9% had severe anemia as compared to my study which showed mild anemia to be 55%, moderate anemia 20% and severe anemia to be 11%.[11] The degree of severe anemia is more which may due to cultural or socio-economic reasons.

As this is a known fact that IDA when diagnosed the iron reserves are already depleted and hence the complete cure of anemia is achieved when

- The cause is treated
- The optimal HB levels achieved
- The iron reserves are restored

It has been estimated that with proper intake, dosage & absorption, the buildup in Hb is 0.2g/dl/day or approximately 2.0g/dl within 3 weeks. Once the Hb levels are normalized, the iron should be continued for at least 4-6 months until a target serum ferritin level of approximately 50μg/L is achieved. It implies that for a woman having Hb 9& below, the time & cost for restoring Hb levels will increase exponentially. If a woman with Hb of 9 g/dl is on iron therapy, it will take 3 weeks to get an Hb level of 11g/dl and another 4-6 months to achieve the optimal iron reserves. Now one can calculate the cost per patient which may be required to treat anemia & restore reserves may be in thousands even with oral therapy.[12,13,14]

Pakistan is a poor country with high fertility rates. According to statistics, the fertility rate in Pakistan is 3.8 ,and women population is about 52% (6). So in a population of 188 million, 90 million are women & if 60-70% are having Hb levels below 12g/dl, one can estimate the cost spend by Pakistanis just to treat IDA will go in billions of rupees.

The Hb levels are also associated with the level of education, awareness & local health facilities. The same observation is made when anemia was studied in rural population of Sindh where 71% of patients were found to be anemic during pregnancy.[6] According to demographic survey of Pakistan 2012-2013, intake of Iron supplementation is also observed to be less in women of older age group who are already anemic & hence will require more time & doses to build their iron reserves. The awareness of their low Hb status is also less among most of the women .This will adversely affect their chances of improving their nutritional status on their own. This has also been proven by the demographic survey of Pakistan 2012-2013 where women with more than a secondary education (77%) & women in the highest wealth quintile (68%) are more likely to have taken iron supplements during

their pregnancy than women with less education & those in lower quintile. Thus like a vicious circle ,those who need more Iron supplements are actually the ones never getting it & so whenever in need, these less privileged will have to spend more money & spend more time on a treatment not directly relating to anemia. One representative study carried out in Multan, the fourth biggest city of Pakistan, demonstrated a correlation between the prevalence of anemia, dietary habits and the socio-economic status of the mothers.

Multiparity was reported to persist among such groups and 86% to 96% of these women had Hb <11.0 g/dL. The mean income of the subject families was reported to be ~ 3.96 thousand rupees (~40 US$) per month which appeared to be insufficient.[15] IDA has been widely debated as one of the principal nutritional causes that hinders the national progress on account of its adverse health consequences and economic loss of billions of dollars annually in the developing countries. Estimates show that the number of people globally suffering from IDA is 293 million (47%) children <5 years and 468 million (30%) non-pregnant women.[15,16,17] The cost to cure these vulnerable population segments might be exceeding billions of dollars.

Pakistan, as a developing nation has been a potential victim of the disease burden and the loss in GDP, merely owing to micronutrient deficiencies. Approximately, US$ 3 billion are spent each year for the treatment of disease associated with micronutrients deficiencies which suggests a timely micronutrient intervention to restrict the cost to US$ 83 million. Gestation and early years of life are important and require more cautious approaches to limit permanent economic and health losses due to malnutrition in Pakistan. Another study reported high disease burden (15% of deaths of children <5 years) signifying hidden hunger to be critically damaging in terms of health and wellbeing of population in Pakistan.[18,19,20] Nation-wide comparative economic losses incurred each year to address malnutrition in various regions are significantly alarming, for example Egypt loses 0.44% of GDP, Bangladesh and Pakistan spend around 0.5 billion dollars, India is expected to be expending $ 3.8 billion, and Nepal and Sri Lanka are allocating $ 5 billion each year.[20] These data confirm the magnitude of economic losses associated with IDA thus suggesting global efforts for materializing a sustainable healthier world by recognizing micronutrients deficiencies as an issue of public health significance. Several measures have been suggested to curtail IDA and its health and economic consequences that include improvement in infant and child nutrition, breastfeeding, good nutrition for women during pregnancy for safer birth outcomes. Combating IDA among infants and adults would save several billions of dollars annually in the shape of better cognitive performance and productivity. Prevention of ID and IDA through adequate nutritional and/or therapeutic applications is important during critical periods of the life cycle.

Several preventive approaches to deliver bioavailable iron have been efficiently attempted e.g. iron fortification of foods, dietary modification and supplementation. However, no single strategy seemed to work effectively and multiple ways to improve iron nutrition have shown promise to overcome this nutritional deficiency especially in developing societies. The potential approaches to prevent ID and IDA can be:

- Iron Fortification
- Dietary modifications
- Supplementations
- Control of infection

Every approach has its merits & demerits. No one method has still proved to be most effective. Food fortification approximately, 540 million people gained access to fortified flour in 2007. These data show a worldwide increase of 9% in wheat flour fortification with twenty one countries practicing mandatory wheat flour fortification.[21] Wheat flour fortification is still not been widely practiced in Pakistan due to certain constrains like maintaining flavor, color &taste of food along with awareness among people especially among rural population & lastly means of transportation of fortified food. But a vital step was taken by GAIN

(Global Alliance for Improved Nutrition) through awarding a considerable financial support for commercial wheat flour fortification and to ensure that the fortified flour reach 45 percent of the population in Pakistan.[22]This was suspended in 2010 due to 18th Constitutional Amendment which gives the Provinces the authority on Health (along with other fields of managements). By that time, 125 flour mills were practicing food fortification. In 2009, commissioned evaluation report on NWFFP (National Wheat Four Fortification Program) showed that there is a strong role of legislation for ensuring the future success of Wheat flour fortification. The current situation is that there is No provincial legislation in any of the province on wheat flour fortification.[23] However, globally 75 countries practice food fortification with Iron & Folic acid& evident by studies from Central Asia[24], Venezuela[25], & Iran[26], wheat fortification can significantly improve population Iron status measured by serum Ferritin, Hb concentration& even cognitive functions[27] It has been estimated that Wheat Flour fortification, if made mandatory, will save 3285 /yr of a child's life & 491/yr of maternal life.

CONCLUSION

The cost & benefits of Wheat flour fortification outweigh the cost & resource spend to treat & prevent IDA along with the protection from blood-transfusion infections like HIV, HCV & HBV.

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