PREVALENCE, KNOWLEDGE AND TREATMENT OF IRON DEFICIENCY ANEMIA AMONG ADOLESCENT CHILDREN (10-19 YEARS) (MALE & FEMALE) IN SIDDHA PERSPECTIVE- A LITERATURE REVIEW.

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Introduction

A critical step in the process of conducting educational research is to conduct a review of the relevant literature. It allows the researcher to identify gaps in the research and patterns in a specific field. Future researchers can create their designs more precisely by learning about the designs, samples, and research methods used by past researchers. To be able to make an original contribution, researchers must be aware of recent studies that have been undertaken in the field.

The exact observation was made by Good (1972), who stated that "the researcher will be groping in the dark and possibly repeating the work already done." Therefore, a thorough analysis of all the available literature is required to conserve time, energy, and resources. An extensive, thorough, identification in a systematic manner and summary of written sources that include information on linked problems is known as a review of the literature defines Basavanthappa (1998). He also includes that every study or research effort must include a literature review. It fosters insight and increases the breadth of understanding of the issue. The evaluation of the literature clarifies the study and the findings that are connected to it. This article reviews the

material from both traditional and contemporary sources that are pertinent to anaemia in adolescent schoolchildren and preventive approaches to treat this illness.

According to WHO health is defined as a state of well-being and not merely an absence of disease or infirmity. According to Scientist Levy (1980), medical care services along with proper nutrition raise people's standards of life by lowering illness, raising mortality rates, and extending life expectancy. He also adds that health is not just a personal matter, it is also a social one. A person's physical and mental abilities are diminished by ill health. When people recognise their health problems, the availability, affordability, accessibility, adequacy, and acceptability of the health infrastructure affect their approach to obtaining treatment.

Iron is a micronutrient. It is employed in the production of haemoglobin, the transport of oxygen, the development of the brain, the control of body temperature, and the contraction of muscles. Iron deficiency is referred to as a decrease in the body's iron levels. The most frequent etiological factor for anaemia is deficiency of Iron. Iron deficiency anaemia (IDA) is characterised by a reduced haemoglobin level says Park (2007).

The study is focused on the adolescent age group. Adolescence is a transitional period between childhood and adulthood. Girls throughout their adolescence are known to be in a specific stage of their lives that calls for particular and unique care. Being an age group that "enters" motherhood, adolescence is a crucial stage of life. The health and nutrition of a women's future children will be significantly influenced by her current state of health. The adolescent undergoes a 2 to 3-year growth spurt that is noticeably accelerated, along with a significant change in their physical size and proportion.

Adolescent girls' nutritional and health needs are typically ignored. By the time they reach adolescence, they have a poor body size, slow growth, and narrow pelvises as a result of poverty, malnutrition, and neglect, which increases the risk for childbearing. Girls between the ages of 13-18 have lower iron levels, and as menarche approaches, they become more prone to anaemia. In the 4.5 million marriages that occur in India each year, many girls from low-income families are pressured into being married young and are already anaemic. These marriages are usually consummated practically quickly after menarche.Three million adolescent girls between the ages of 15 and 19 are getting married each year (Glimpses of girlhood in India). Between the

ages of 14-18, girls have their first child, which causes low birth weight newborns and postnatal issues.

The Siddha System of Medicine places a strong emphasis on the fact that medical care must take into account the patient's physical state as well as their environment, physiological condition, and other factors in addition to the disease itself. This indicates that the treatment must be individualised and customised to minimise errors in diagnosis or treatment.

The "AndapindaThathuvam," or Panchaboothas, are the basis of the Siddha system. The human body's physical component is referred to as "UdalThathus," whereas the three humours, or the functional parts of the human body, are referred to as "UyirThathus" (the physiological unit ie.,Vatham, Pitham,Kapham). Although the diagnosis depends upon "Envagaithervu," which includes Naa, Niram, Mozhi, Vizhi, Malam, Moothiram, Naadi, and Sparism, the therapy is based on "Thridosha theory."

Diseases are seen as an imbalance between the three humours, while health is seen as the maintenance of that equilibrium. In the Siddha system, several preventive practices are also explicitly addressed. Among these, the diet has a significant impact.4,448 different diseases were classified by Siddhar. One of the illnesses that usually affect women and young children is PaanduNoi, also known as VeluppuNoi. This disease "*PaanduNoi*" is as old as the evening star. *"Paandu"* has historical importance. The word "*PaanduNoi*" has been derived from *"Hindu Epic Mahabharatham"* where the five heroes "*PanjaPandavars*" father is "*Paandu"*. ". This man is said to have been very pale when he was born. People suffering from anaemia, like Paandu Maharaja, are pale in colour. As a result, the disease is known as PaanduNoi. In this article, the literature evidence based on anaemia, its prevalence, treatment and preventive aspects according to Siddha literature has also been elaborated.

1.1 Iron Deficiency Anemia (IDA) Incidence Among Adolescent Children

- **Global Burden of Anemia**

The most prevalent disorder associated with nutritional deficiency is anaemia.

According to the Global Nutrition Assessment 2016, India has one of the highest rates of iron deficiency and ranks 170th out of 180 countries for women's anemia. Iron deficiency aaemia is related to both malnutrition and poverty says Kapur et al (2002).

Iron deficiency is thought to be the cause of 50% of anaemia globally, according to Stoltzfus RJ's (2003) study. Iron Deficiency Anaemia is responsible for 841,000 deaths and 35,057,000 years of lost life due to disability worldwide, ranking 9th out of 26 risk factors in the Global Burden of Disease (GBD) 2000. In contrast to North America, which bears 1.4% of the global burden, Africa and some regions of Asia account for 71% of mortality and 65% of disability-adjusted life years lost. The author also says that the creation of efficient and long-lasting therapies to manage iron deficiency anaemia is urgently needed. Without significant participation from the corporate sector, this is unlikely to be accomplished.

As per WHO reports anaemia affects 1.62 billion individuals worldwide, accounting for 24.8% of the population. Children in preschool have the highest prevalence (47.4%), and males have the lowest prevalence (12.7%). Pregnant women (41.8%) are the population segment with the greatest number of affected individuals. Maternal and perinatal mortality in women may have anaemia as the underlying reason says Ezzati M et al (2002). Beard JL (2005) in his study he revealed that in the age range of 15 to 59 years, 26% of males and nearly 50% of women of reproductive age are anaemic. More than half of Indian women (55%) have anaemia, of whom 39% have mild anaemia, 15% have moderate anaemia, and 2% have severe anaemia, according to the National Family Health Survey (NFHS)-(III). According to scientific studies in the developing world, adolescent anaemia is the biggest nutritional issue. 55% of adolescent girls in India are anaemic.

- **National Scenario**

India has a higher prevalence of anaemia than other developing countries relative to all demographic categories. In India, anaemia is estimated to affect 50% of the population. The problem is particularly significant because it affects women more than men. According to estimates that anaemia causes 20% to 40% of maternal deaths in India, one in two Indian mothers (56%) has some form of anaemia.

According to data from the National Nutrition Monitoring Bureau (NNMB), the District Level Household Survey (DLHS) and the Indian Council of Medical Research (ICMR) surveys, anaemia is extremely common (ranging between 80 and 90%) in small children, pregnant and breastfeeding women, and adolescent females. Young children, expectant mothers, and newborns with low birth weights are particularly vulnerable to anaemia. So, anaemia develops in childhood, worsens in adolescence in females, and intensifies during pregnancy.

According to Kalaivani (2009), India has one of the world's highest percentages of anaemia. Pregnant women and young children have a higher prevalence of anaemia. Even among higher-income, more educated populations, approximately 50% of children, adolescent girls, and pregnant women are anaemic. The main causes of the high prevalence of anaemia are inadequate dietary iron intake, low folate intake from vegetable consumption, possibly low B12 intake, and poor dietary iron bioavailability from Indian diets rich in fibre and phytate. Higher prevalence in particular groups is influenced by increased iron requirements during growth and pregnancy as well as chronic blood loss. Poor intrauterine growth, a higher likelihood of preterm deliveries, and a higher prevalence of low birth weights are all related to maternal anaemia. In turn, this leads to greater rates of prenatal morbidity and mortality as well as newborn mortality. As a result, maternal anaemia contributes to an intergenerational cycle in which the children's growth is inadequate.

According to the study report, at least 67% of infants (6-59 months) have anaemia, up from 58.6% in the last survey carried out in 2015–16. According to the research, among adults aged 15 to 49, 25% of males and 57% of women had anaemia. Low amounts of haemoglobin in the blood are the characteristic of the disorder known as anaemia. Its incidence among women has increased from 53% in 2015–16 to 57% in 2019–21. It has increased from 23% to 25% among men.

According to the National Family Health Survey (2015–2016), anaemia affects over 53% of Indian women, which is an important problem. The 2017 National Health Policy, which is being presented by the Ministry of Health and Family Welfare, Government of India, acknowledges this significant burden.

As per the reports from International Institute of Population Sciences, 2022, from 2005-2006 to 2019-2021, NFHS estimates that anemia prevalence among Indian adoloscents aged 15-19 years has slightly increased (girls: 55.8% to 59.1%, boys: 30.2% to 31.1%)

One-third of the world's population is thought to be affected by iron deficiency, which is a relatively prevalent nutritional condition. IDA is less common in wealthy nations, but it is highly common in India. Data from the National Family Health Survey (NFHS) III show that 71% of children in urban areas, 84% of children in rural areas, and 79% of children overall have anaemia.

2.1 Need For The Study

Adolescence is one of the most difficult stages of human development. A sharp increase in growth rate abruptly alters the generally consistent growth of childhood. Nutritional demands are created by abrupt alterations. For a variety of reasons, adolescence is seen as a particularly nutritionally susceptible time. Three main reasons are given below,

Due to their rapid increase in physical growth and development, they have a greater need for nutrients.

I. Adolescent children's shifting eating and lifestyle patterns have an impact on their nutritional requirements and intake.
II. Pregnancy, the early stages of an eating disorder, an excessive diet, the use of alcohol and drugs, and various other circumstances can have an impact on adolescent nutritional needs.

Anaemia is more likely to occur during:

a) Early childhood, when growth is brisk.

b) Adolescence is characterised by rapid growth and iron loss during menstruation.

c) Pregnancy is characterised by rapid growth of the foetus and maternal tissues.

Therefore interventions for anemia in the adolescent children is very much needed so that healthy individuals can be found in later stages of human life.

3.1 Impact Of Iron Deficiency Anemia In Adolescent Children as per KAP studies

Adolescent girls in India contributes a sizeable portion of the population, are a vulnerable group and are more likely to suffer from morbidity and death. The most significant number of physical, psychological, and behavioural changes occur during this phase of life moulding. During this stage of the human life cycle, nutritional anaemia is more likely to occur. Adolescent girls are especially vulnerable to Iron Deficiency Anaemia (IDA) due to the increased demand of iron for red blood cells and myoglobin, as well as to make up for iron lost during menstruation and due to poor dietary patterns.

Agustina R (2021) used clustered random sampling to conduct a cross-sectional survey of 335 adolescent girls. The KAP questionnaire had 18 variables, including 9 knowledge questions, 3 attitude questions, and 6 practice-related questions. Stunting, nutrition, dietary diversity, and environmental health conditions were among the twelve factors studied in relation to anaemia.

The 2014 Food and Agriculture Organization nutrition-related KAP guidelines for anaemia served as the basis for the questionnaire's adaptation. A semi-quantitative food-frequency questionnaire and 2-day 24-hour recalls were used to assess dietary habits. Multivariate logistic models and linear regression models, respectively, were used to evaluate the relationships between KAP and anaemia and the height-for-age z-score (HAZ). Instead of being positively correlated with higher HAZ among adolescent girls, the KAP linked to nutrition and healthy settings were not associated with the prevalence of anaemia. The author concludes the study by suggesting that KAP improvement and other proven effective nutrition interventions should be included in any strategy to lower anaemia risk in this population.

Singh M et al., (2019) conducted a cross-sectional survey in a northwest districts of Delhi in 2012. This study involved 210 adolescent schoolgirls. KAP was evaluated about anaemia using a pretested, predesigned and semi-structured questionnaire. The current study found that adolescent schoolgirls knew less about anaemia. Only 60 (28.5%) of the 210 girls had heard of anaemia, and of those, 50 (83.3%) believed it to be a health issue. Only a small percentage of girls properly responded to questions about the symptoms, prevention, and treatment of anaemia. 170 individuals (or 80.9%) washed their hands with soap, and the remaining 19% cleaned with only water. Before consuming food, just 52% of girls washed their hands with soap. 160 (76.2%) of the girls frequently clipped their fingernails, and 28.5% of the girls walked outside the house barefoot. The study results revealed that the Adolescent girls exhibited knowledge of anaemia but not adequate attitude and practice. The author also suggests that it should become mandatory to spread comprehensive nutritional knowledge about diet and iron-rich supplements.

Honnakamble RA &Rajoura OP (2019) carried out an interventional study to assess the knowledge, attitude, practice and health-seeking behaviour change regarding anaemia after weekly iron-folic acid supplementation and intensive health education among adolescent school girls of Delhi.A pre-tested questionnaire including the knowledge, attitude, behaviours, and health-seeking behaviour related to anaemia was given to 106 adolescent schoolgirls in the XI class. Six months of intense health education and weekly iron-folic acid supplementation (WIFS) were administered as an intervention. Powerpoint presentations, pamphlets, and a visual display of iron-rich foods like green leafy vegetables, germinated pulses (sprouts), citrus fruits, and jaggery were all included in the health education package.According to this study, only 34.9% of girls had heard of anaemia and 38.9% believed it to be a health issue. About 8 (7.5%) people

who were asked to name the causes of anaemia responded correctly. After the intervention, there was a change in knowledge, practices, and health-seeking behaviour that was statistically significant. The author comes to the conclusion that more nutritional interventional research is required to support effective preventative measures against anaemia.

The study's goal is to evaluate the effectiveness of a dietary education intervention on the knowledge, attitude, and practice (KAP) of female adolescents with iron deficiency anaemia in the Gaza Strip, Palestine. 89 female adolescents between the ages of 15 and 19 were recruited for this intervention trial and were randomly assigned to the intervention and control groups. For three months, both groups received weekly iron supplements (200 mg of ferrous fumarate). For three months, the intervention group went to nutrition education seminars while the control group did not. KAP surveys were completed by the two groups both at the beginning and six months thereafter. The three-month-long nutrition education initiative included lectures, presentations, interactive discussions using posters, as well as the distribution of informational leaflets and brochures regarding healthy eating. KAP and total scores were evaluated before and after the intervention. Compared to controls, nutrition education interventions affected changing the knowledge, attitude, and practice of female adolescents with iron deficiency. In Palestine, the nutrition programme should be incorporated and integrated into comprehensive intervention programmes aimed at IDA among teenagers at various levels suggests Jalambo MO et al., (2017).

Girls in their adolescence are more prone to anaemia. KAP assessments are typically appropriate to assess the efficacy of intervention programs. A study was carried out by Chaluvaraj TS &Satyanarayana PT (2019) to assess the knowledge, attitude and practise regarding anaemia and improvement in anaemia after health education among high school girls in rural Bangalore. They carried out a cross-sectional interventional study among 100 adolescent girls of age group 14 to 16 years. Initial evaluation revealed inadequate knowledge, a poor attitude, poor practice, and so many forms of health education had been provided. The study's overall findings demonstrated that after receiving health education, female adolescents' knowledge, attitudes, and practices are shifting positively. The future lives of women can benefit greatly from comprehensive nutritional education regarding anaemia and its effects on adolescents.

4.1 Literature Review On Allopathic Interventions for Iron Deficiency Anemia

In their study, Rajaratnam Jolly et al. (2000) found that the prevalence of anaemia was 44.8%, with mild anaemia accounting for 36.5%, moderate anaemia for 6.3%, and severe anaemia for 2.1%. Although the prevalence did decline with age, the difference was not statistically significant. Premenarchal girls had a 40.7% anaemia prevalence while postmenarchal girls had a 45.2% anaemia prevalence.

According to Kanani et al. (2000), approximately 70% of adolescent girls in India have anaemia, indicating a high prevalence. In other parts of the world, iron-folic acid (IFA) supplements have been demonstrated to improve adolescent growth. A study was carried out in Vadodora, India, to examine the effects of IFA supplements on haemoglobin, hunger, and growth in teenage girls between the ages of 10 and 18 to confirm these findings there. The findings demonstrate a significant desire for IFA supplements, with >90% of the girls consuming 85 of the 90 tablets offered. In the group of girls taking IFA supplements, haemoglobin levels increased by 17.3 g/L, but they slightly dropped in the girls in the control group. Girls and parents reported that girls increased their food intake and gain in weight of their children. So IFA supplementation is recommended for growth promotion among underweight adolescents.

In their study, Rawat et al. (2001) discovered that 174 (34.5%) of the 504 teenage girls were anaemic. Additionally, he discovered in his research that anaemia was substantially more common (45.2%) in adolescent girls from joint families than it was in nuclear families (28.3%), which suggests that household food security may play a role.

120 schoolchildren in Coimbatore participated in a study by Leela et al. (2002) to determine their iron status and patterns of illness. The results showed that for the non-anaemic, mildly anaemic, and moderately anaemic groups, respectively, the mean haemoglobin level was 12.5, 11.03, and 9.17 g/dl.

In a research on the prevention and control of anaemia in adolescent girls using the Andhra Pradesh school system, conducted by the Indian Institute of Health and Family Welfare in Hyderabad in 2002, it was discovered that 1516 of the 1811 females enrolled in the study from Classes VI to X. 81% of respondents reported that iron deficiency anaemia was their most common dietary issue. A total of 63.2%, 12.5%, and 5.3% of responders showed mild, moderate, or severe anaemia, respectively. Only 19% of those surveyed had haemoglobin (Hb) levels that were normal or over 12 g/dl.

In his study, Kumar Dharmender (2003) found that iron deficiency anaemia is the most prevalent and serious health issue among school-age children. In his research, he found that adolescents who attended school in the Kashmir valley district of Srinagar had a high frequency of iron deficiency anaemia (31.6%).

According to Bagchi (2004), anaemia has persisted as a serious public health issue in nations in the Eastern Mediterranean. Prevalence rates for preschoolers range from 17% to over 70%; for adolescents, they range from 14% to 42%; and for women of childbearing age, they range from 11% to over 40%. Although the prevalence of anaemia has frequently been used as a proxy indicator for iron deficiency anaemia, this approach is invalid when the cause of anaemia is complicated or unidentified or when other micronutrient deficiencies of folate, vitamin B12, and vitamin A can co-exist.

According to Soekarjo (2004), baseline anaemia prevalence (Hb120 g/l) was 20% in prepubertal girls and 26% in adolescent girls, 24% in prepubescent males and 11% in adolescent boys (pubertal). Blood retinol concentrations were modest in 41% of boys and 45% of girls (1.05 mol/l). Haemoglobin concentrations were not raised by the therapies.

In their study, Verma et al. (2004) discovered that the majority (81.9%) of girls were anaemic, with 55.1% of them having mild anaemia, 0.6% having severe anaemia, and the remainder having moderate anaemia. Girls whose fathers worked as semiskilled or skilled employees (77%), and who tended to drink tea or coffee after meals (94.4%), were shown to have considerably higher rates of anaemia. Girls who ate green leafy vegetables had significantly decreased anaemia prevalence.

In a cross-sectional study conducted in 2004 by Basu et al., 1120 adolescents between the ages of 12 and 18 who appeared to be in good health were evaluated for the prevalence of anaemia and serum ferritin status. According to WHO guidelines, females (23.9%) had a considerably greater overall prevalence of anaemia than boys (13.9%). Teenagers from rural areas (25.4%) had higher rates of anaemia than those from urban areas (14.2%).

Anaemia prevalence was examined by Deepa et al. in 2004. In the rural area, nearly 35% of the adolescent girls had moderate anaemia, 22-25% had mild anaemia, and close to 32% had

severe anaemia. Nearly 17.5%, 35%, and 32.5% of the patients in the urban area, respectively, had severe, mild, and moderate anaemia.

A research was conducted by Gur et al. (2005) to determine the prevalence of anaemia among elementary school students. The study group consisted of 1531 students aged 6 to 16 from 14 primary schools dispersed throughout Istanbul's seven distinct districts. Anaemia was found to be prevalent in the population overall at 27.6%. According to Kakkar et al. (2006), adolescent school girls had a prevalence of anaemia of 58.4% overall. The early adolescent (10–13 Years) age group had a greater level of anaemia.

In an urban slum environment, Choudhary et al. (2006) carried out a community-based, cross-sectional research to ascertain the prevalence of anaemia among adolescent girls of South India who are not married. 100 young women between the ages of 11 and 18 who appeared to be in good health were enlisted. Their socioeconomic status, food habits, and anthropometric measurements were recorded, and blood haemoglobin (Hb) levels were calculated. Anaemia (Hb 12 g %) was 29% prevalent. Most of them had mild anaemia; no one had severe anaemia. Serum ferritin levels in two-thirds of anaemic patients were low (12 g/L).

Anaemia prevalence among school children (5–15 years old) in Bangalore was examined by Muthaya et al. in 2007. This group's overall anaemia frequency was 13.6%. Girls were more likely than boys to have anaemia (15.3%). The prevalence of anaemia among children from urban and rural areas (14.6 and 12.3%, respectively) did not differ significantly.

According to a 2007 study by Kalpana et al. carried out among 500 adolescent girls (aged 13-15 years) from low-income families in Coimbatore, 76.4% of adolescent females were anaemic, while just 23.6% were not anaemic. A study on the prevalence of anaemia in 100 adolescent females (13–18 years old) in Manipur was undertaken by Kowsalya et al. in 2008. The findings showed that out of all the participants, 25 females had mild anaemia (10–12 g/dl), and 30 had moderate anaemia (7–10 g/dl). Ten girls had low haemoglobin levels (7.0 g/dl).

According to the most recent NFHS data, adolescence and IDA, also known as iron deficiency anaemia, are closely related in India. Though 56% of boys are developing anaemia at the same rate as adolescent girls. According to the survey, anaemia affects 30% of adolescent boys. The National family health survey (NFHS-3), carried out in 2005–2006, provides statistics

that show an increase in anaemia cases. Most anaemic patients—particularly women—have mild to severe iron deficiencies. Most teenage girls in India have haemoglobin counts that are lower than the established global threshold of 12 g/d.

In their study, Haidar et al. (2009) found that 18.0% of people had iron deficiency anaemia on average. The age group of 31 to 49 years old had the highest incidence of anaemia, iron deficiency, and iron deficiency anaemia. Meat consumption less than once a week and vegetable consumption less than once a day were both frequent and linked to higher anaemia rates.

According to Chang et al. (2009), teenagers' mean haemoglobin levels (12.5 ±0.9 g/dl) were substantially higher than those of adults (12.1±1.3 g/dl). Adults (41.7%) had a higher prevalence of anaemia than adolescents (28.3%). Adolescents with anaemia consumed fewer nutrients than their non-anaemic peers.

In their study, Ramzan et al. (2009) discovered that the majority of anaemic boys—58.82% of healthy, normal-weight boys—were 6 years old or younger. Similar to boys, 70% of healthy, normal-weight girls had anaemia, increasing to 100% at age 6 and 66.66% at age 10.

5.1 Siddha Literature On Iron Deficiency Anemia

Paandu is a disorder marked by the pallor of the conjunctiva of eyes, nails, and skin as a result of a decrease in red blood cell level, according to the Tamil literary work Agasthiyarvaithiyakaviyam. Numerous siddhars identified etiological causes which covers things like morality, lifestyle, and eating habits.

According to Balavagadam,Paandu may have been inherited from the parents. It might result from genetic problems. The causes of Veluppu, according to YugiVaithiyaChinthamani – 800 the habits that lead to VeluppuNoi are frequent attacks of diarrhoea, an excessive intake of salty and sour foods, living in a warm environment, an excessive amount of pan and nut chewing, and an excessive amount of daytime sleeping.

Following ThanvanthiriVaithyam, the imbalance between vathampitham and kabam, consuming food that has been exposed to mud, building up too much heat, excessive sorrow, being poor, and psychological problems may all contribute to the development of PaanduNoi. According to ThanvanthiriVaithyampart II, elevated pitha during hot seasons as a result of

increased consumption of sour, salt, and pepper will derange kabha, ruin the natural skin tone, and lead to PaanduNoi.

AgasthiyarGunavagadam claims that improperly prepared food, carelessness concerning treating diarrhoea, heavy bleeding, and grief all contribute to PaanduNoi. In line with Guru Naadithere are several reasons why pathological blood loss might happen, but one of them is worm infection, which causes anaemia by causing chronic blood loss from the intestine.

According to AgasthiyarGunavagadam, PaanduNoi symptoms include dry skin, pallor of the face, tongue, eyes, lips, and nails; anorexia; swelling of the eyelids, fatigue, dyspnea with exertion, palpitation, oedema of the ankle joint and increased heart noises. Yugi Muni lists the following symptoms of pithapaandu: yellowish discolouration of the skin, thirst, dizziness, tastes acrid like pepper, dyspnea and bitter taste in the mouth.

According to AgasthiyarGunavagadam, a low iron diet causes "Ranjagapitham" to become deranged as a result of a nutritional deficit. Blood is coloured by ranjagapitham, which is also responsible for blood formation. Pithahumours are increased, and this causes PaanduNoi.
Pitha naadi, kabhanaadi, vathanaadi, kabhavathanaadi, and kabhapithanaadi may all be present. This is supported by the quotations from valmeegiyarvaithyam and sadhakanaadinool.

Piniyarimuraimai is a technique for identifying illnesses that affect people. It is founded on three core tenets. They are

1. Poriarithal (Examination of the skin, tongue, eyes, nose, and ears, the five senses of perception)

2. Pulanarithal (Five objects of the senses—tactile sensation, taste, sight, smell, and sound—are palpable)

3. Vinathal (Interrogation**)**

Pori, PulanalArithal:

Mei (Skin examination) includes Pallor of skin, Mild Yellowish discoloration of the skin, the characteristic feature of all pitha disease and Koilonychias

Vai (Tongue Examination):

The examination of the tongue includes Pallor of the tongue, Angular stomatitis, Glossitis, and Atrophy of papillae(Bald tongue).

Kan (Eye Examination):

It includes the Pallor of conjunctivae.

VINATHAL (Interrogation):

The following have to be asked to the patients at the time of examination

- Anorexia
- Breathlessness / Dyspnoea
- Thirst
- Giddiness
- Diminished vision
- Faintness
- Palpitation
- Lack of memory
- Lack of concentration

6.1 Literature Review On Siddha Intervention For Iron Deficiency Anemia

Author Rajalakshmi et al. (2017) conducted research on Annabethichenthuram's preparation and characterization. Annabethichenthuram was synthesised, its physico-chemical properties were examined, and it was then described using Fourier-transform infrared spectroscopy, X-ray diffraction, X-ray fluorescence, scanning electron microscopy, and particle size analyzer. The amount of loss on drying (1.0%), total ash (65.94%), water soluble ash (1.864%), and acid insoluble ash (39.02%) were among the physical and chemical characteristics that were calculated. Fourier-transform infrared spectra revealed an increase in iron concentration in comparison to the raw drug (peaks at 617 and 430). With the aid of an X-ray diffraction pattern, the presence or absence of -Fe2O3 in AnnabethiChenthuram was established. Iron and iron oxide were both present in the medication (66.46% and 93.58%, respectively), according to X-ray fluorescence analytical results. These findings offered empirical support for AnnabethiChenthuram's transformation of iron sulphate into a consumable and bioavailable form. This specific medication is frequently used to treat anaemia.

A standardisation technique was carried out by Sundaram M. (2018) for the siddha drug MadhulaiManappagu. The syrup is a reddish brown liquid that is in liquid form. It has a lovely odour and is quite viscous and opalescent. The syrup has a specific gravity of 1.2670. The syrup

is devoid of aflatoxins, according to the aflatoxin assay. The syrup tested negative for any evidence of pesticide residue, according to the analysis results. The formulation has been examined for microbial contamination as well as the presence of steroids, alkaloids, flavonoids, tannins, phenols, carbohydrates, and glycosides. The quantitative analysis of the syrup yielded estimated amounts of 2.80 0.11 mg/gm of flavonoids, 0.632 0.04 mg/gm of alkaloids, 0.37 0.03 mg/gm of tannins, and 0.97 0.05 mg/gm of phenol. The ash's overall value is 5.66 1.69%. Lead, mercury, cadmium, and arsenic are all below the detectable limit. The GC-MS results analysis the presence of ascorbic acid can be seen in the eleventh prominent peak of the syrup, which has 12 prominent peaks overall. The erythropoiesis is supported by this ascorbic acid, which is also necessary for the body to absorb iron from the intestines. The current study's findings support the safety profile of the MadhulaiManappagu-Siddha herbal syrup designed for paediatric use and are suggestive of the presence of active phytoconstituents that are responsible for its effectiveness in treating PanduNoi (Iron Deficiency Anaemia) in children.

Devaki R. and Santhosh Kumar R. (2022) provided a review on anti-anaemic herbs in the siddha medical system. Medicines such as "Ayajambeerakarpam" and "Ayabringarajakarpam" are made from iron and lemon, and Ecliptaprostrata (Karisalankanni) is especially useful for anaemia. Dietary advice such as pomegranate, Indian gooseberry, fig, dates, and greens such as karisalai, ponnangani, cury leaves, drumstick leaves, and so on can help manage anaemia significantly. It can be efficiently prevented and treated with dietary sources of heamatinic medicinal herbs, grains, and millets that serve as nutritional supplements, as well as with good cleanliness, sanitation, and routine deworming procedures.

7.1 Management & Prevention Of Iron Deficiency Anemia In Siddha Literature

The emphasis of Siddha treatments is on prevention and renewal in addition to total recovery. The following is said:

- Kaappu (Prevention)
- Neekkam (Treatment)
- Niraivu (Restoration)

The following guidelines must be taken into account when treating a patient for a disease.

"Noinadinoimudhalnadiadhudhanikkum

Vaainadivaipachcheyal."

Making a plan to cure the condition after correctly diagnosing it and determining its underlying cause will result in effective treatment. More emphasis is placed on diet and lifestyle in our Siddha system of medicine than on actual medical issues. The alteration in dietary practisesleads to the disorder of "Thirithodam," which is the underlying cause of many diseases. Vaadha, pitha, and kabhakutram's standard mathirai levels are 1:1/2:1/4. Food changes are the main cause of variance at this level.

The majority of children with PaanduNoi (Iron Deficiency Anaemia) are plagued by worm infestations, hence antihelminthic medications are used first. Loss of appetite is present in all patients. Therefore, the best appetisers are given. In addition to treating the condition, the treatment also aims to prevent it and promote cellular renewal. Rasam and Ratha are particularly afflicted in PaanduNoi. Additionally, iron-rich foods are advised.

" Marundhaeunavuunavaemarundhu
Marupadilladhaundimarundhunin
Oorupaduillaiuyirku".

Dietetics is crucial in the Siddha system of medicine, especially in PaanduNoi, where nutrition is the main determinant of a good prognosis. Overconsumption of an imbalanced and inconsistent diet is thought to be the primary factor in the imbalance of the three doshas, which can then result in the development of a variety of illnesses.

Food that is simple to digest and high in iron is preferred.

a. Greens:

Karisalai (Ecliptaprostrata), Ponnanganni (Alternantherasessilis), Sirukeerai (Amaranthus tricolor), Arukeerai (Amaranthusdubis), Manathakkali (Solanumnigrum), Murungai (Moringaoleifera) keerai.

b. Vegetables:

Katharipiinju (Solanummelongena), Avaraipinju (Lablab purpureus), Murungaipinju (Moringaoleifera), Vazhaikattchal (Catharanthusroseus), *Lycopersicone sculentum (Shimaithakkali)*

c. **Fruits:**

Madhulai (Pomegranate- Punicagranatum), *Vazhaipalam* (Banana), *Poosani* (Pumpkin), *Neerkumizhipalam* (Jamun), *Drakshai* (Raisin or Grape fruit), *Nelli (Embolic myrobalan), koyya* (Guava- Psidiumguajava), Mambalam (MangiferaIndica), Papali (Carica Papaya), Apple (Malusdomestica), Apricot (Prunusarmeniaca), Athi (Ficusracemosa)

- Food substances that can increase blood haemoglobin levels and stimulate appetite are given in the early stages of the disease.
- The only foods recommended in severe cases of indigestion and anorexia are kanji and soups.
- To improve overall health statusKaadai (Coturnix coturnix), Gowthari (Ortygornis pondicerianus), Udambu (Lanthanotus borneenis), Vellattukari (Capra hircus) are included in the diet
- Regular intake of dates (Phoenix dactylifera) is encouraged
- Iron is abundant in oats, green leafy vegetables, and wheat.
- Ragi (Eleusine coracana), PanaiVellam (Palm jaggery), Kadalai (Arachis hypogaea), Ellu (Sesamum indicum) can be given.

8.1 Literature Related To The Effect Of Nutrition On Hemoglobin Level

Nokes and colleagues confirm prior research by Pollitt and colleagues (1986) that defective cognitive development in children shows the existence of iron deficiency before it has evolved into overt anaemia in their report of the International Nutritional Anaemia Consultative Group (1998). A reduction in stomach acidity, epithelial problems, and aberrant growth are frequent. Reduced immunological competence, notable flaws in cell-mediated immunity and neutrophils' phagocytic activity, which may increase susceptibility to infection, may be an indication of early iron deficiency. Defects in the structure and operation of the epithelial tissue, particularly the tongue, mouth, nails and stomach, appear as iron deficiency anaemia gets more severe. Some behavioural symptoms of iron shortage seem to respond to iron therapy before the Anaemia is cured, suggesting they may be the consequence of tissue depletion of iron-containing enzymes rather than the effect of a lower level of haemoglobin says Krauses, 2000.

Rani (2010) describes that the quantity of dietary iron that the body absorbs is referred to as iron absorption. About 10% to 15% of the dietary iron that healthy adults absorb varies depending on several factors. Iron storage levels have the biggest impact on how much iron is absorbed. When body stocks are low, iron is absorbed more readily. Absorption diminishes when iron reserves are large to assist guard against the harmful effects of iron overload. The type of dietary iron ingested affects iron absorption as well. Meat protein heme iron absorption is effective. Iron absorption is the amount of dietary iron absorbed by the body. Depending on several variables, healthy persons absorb between 10% and 15% of the dietary iron they consume. The amount of iron that is absorbed is most strongly influenced by iron storage levels. Iron is more easily absorbed when the body's storage is low. When iron reserves are high, absorption decreases to help protect against the negative effects of excess iron.

In his study, Swaminathan (2008) outlined how dietary iron consumption can affect iron absorption. Heme iron is effectively absorbed from meat protein. Adequate dietary intake of iron will prevent iron deficiency anaemia. Examples of such foods include green leafy vegetables like amaranth, spinach, drumstick, coriander and radish leaves, vegetables like beetroot and drumstick, cereals like ragi, barley, and rice (raw milled), legumes like bengalgramme dhal and black gramme dhal, soybean, nuts and oil seeds, as well as fruits like chicko.

9.1 Conclusion

An important dietary deficiency that disproportionately affects people in developing nations is iron deficiency. Expectant moms, newborns, kids, and teenagers who run the risk of iron deficiency have greater iron demands. In underdeveloped nations, low iron bioavailability in diet is the most frequent cause of iron insufficiency. From this literature it is understood that Studies are being conducted in various parts of the world to produce a procedure that is relatively precise, quick, and inexpensive so that it can also be administered with equipment that is not easily broken and does not rely on power. It should be prepared with the individuals we will be working with and other factors in mind as a public professional approach. Only a small number of countries have an effective strategy in place to combat the disease, despite the fact that many have long-standing initiatives targeted at preventing and treating iron deficiency anemia. The rise

of primary healthcare in many nations has given people a significant opportunity to manage iron deficiency anaemia using a simple, affordable, and straightforward strategy. Although food fortification is very effective, it can only be carried out in areas that have the required industrial infrastructure. The siddha aspect of treating and managing anemia is also quick, less expensive and effective as per the literature evidences.

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