EFFECTIVENESS OF DATES WITH AMLA ON ANAEMIC STATUS AMONG ADOLESCENT GIRLS WITH ANAEMIA

A DISSERTATION SUBMITTED TO THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY, CHENNAI, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN NURSING

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CERTIFICATE

This is the bonafide work of **M. SANGEETHA M.Sc.,** Nursing II year student from Sacred Heart Nursing College, Ultra Trust, Madurai, submitted in partial fulfilment for the Degree of Master of Science in Nursing, under The TamilnaduDr. M.G.R Medical University, Chennai.

Dr.NaliniJeyavanthSantha, M.Sc(N)., Ph.D.,

Principal

Sacred Heart Nursing College

Ultra Trust

Place:

Date:

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"I will praise you, O Jesus, with my whole heart,

I will tell all your marvellous works,

I will be glad and rejoice in you;

I will sing and praise your name, oh! Most high"

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APPROVED BY THE DISSERTATION COMMITTEEON: _____

PROFESSOR IN NURSING: RESEARCH

_____

Dr.NaliniJeyavanthSantha, M.Sc(N)., Ph.D.,
Principal
HOD of Child Health Nursing
Sacred Heart Nursing College, Madurai.

CLINICAL SPECIALITY EXPERT :

_____

Dr.NaliniJeyavanthSantha, M.Sc(N)., Ph.D.,
Principal
HOD of Child Health Nursing
Sacred Heart Nursing College, Madurai.

MEDICAL EXPERT :

_____

Dr.Sundarapandian.,MD.,D.C.H(child specialist)
Padma Speciality Care Hospital,
Madurai-02.

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CHAPTER-I

INTRODUCTION

"Maturity is a high price to pay for growing up." - Tom Stoppard

BACKGROUND OF THE STUDY

Adolescence is a significant period of human growth and maturation. Adolescents (10-19 Yrs.) form a large section of population of about 24.3% that is 243 million in India (2011). Unique changes occur and many adult patterns are established during this period. After early childhood, during the adolescent period, growth spurt occurs again. These complex changes from childhood to adulthood are particularly crucial for girls. During this period the risk of iron deficiency and anaemia appears for both boys and girls. The risk then subsides for boys but often continues for girls because of menstrual blood loss or diet (Dall-man, simmers and shekel 1980).

Anaemia among adolescent girls is a public health concern (Syakaskada, 2010). Dr. Shubhada Kanani(2009) stated that anaemia remains a major public health problem in India, affecting over 70% of women in child- bearing age, adolescent girls and young children. Its health consequences affect all age groups in varying degrees.

They are living in diverse circumstances and have diverse health needs. According to World Health Organization, anaemia is generally recognized as the greatest nutritional problem among adolescents.

Anaemia is the condition in which the number of red blood cells in the blood is low. When the number of red blood cells is low, haemoglobin (Hb) count is also reduced, causing low-oxygen carrying capacity of the blood, resulting in physical

exhaustion. Haemoglobin is the part of the red blood cell that carries oxygen to various parts of the body. Anaemia is often measured by the level of haemoglobin in the blood. Anaemia occurs due to blood loss, under-nutrition, pregnancy, worm infestation and chronic diseases like AIDS, cancer, kidney disease, cancer treatment, hereditary diseases like sickle cell anaemia.[Accessed from http//www.wikipaedia.com/ anaemia on 25.6.2011.]

Adolescence in girls starts earlier, with the main growth spurt usually occurring between 11 and 16 years. They may grow upto 10cm (4inch) in a year and put on upto 8kg (18 lb.). Because of more weight conscious than boys, girls usually consume fewer calories and are therefore even more prone to nutritional deficiencies. When their monthly periods start, girls need more iron as well as calcium and zinc. Irregular and painful periods can be caused by nutritional deficiencies and, although the birth-control pill is sometimes prescribed for these problems, it also increases the need for certain nutrients (Shanti Ghosh 2004).

The death of females related to diseases of blood and blood forming organs in the country were 245 per10, 000 population among 5-14 Yrs. and 487 among 15-24 years as against 319 and 335 respectively in the males (1988) (Health information of India, 1994). Rawat et al. (2010) Meerut states, that the overall prevalence of anaemia among adolescent females was found to be 35.1%. It is seen that anaemia affects the overall nutritional status of adolescent females. A significant association of anaemia with socio-economic status and parents' educational status suggests a need to develop strategies for intensive adult education and to improve the socio-economic status of the population through poverty alleviation programs. This should be supported by programs for the prevention of anaemia among adolescent girls through nutrition

education and anaemia prophylaxis. In general, women are at the greater risk of anaemia than men. This is because women lose blood and with it iron protein and other vital nutrients each month during menstruation.

Nutritional anaemia is the most common cause of anaemia, of which iron deficiency is the most prevalent nutritional deficiency. In addition to iron, there are other nutrients that prevent or reduce anaemia and these include Vitamin B6, Vitamin B2, Vitamin B12, Vitamin C, folate and protein. These nutrients are actively involved in the process of blood formation (hemopoiesis) and are termed as hemopoietic nutrients (IAP-2000).

Anaemia due to iron deficiency is still a widespread problem. Among adolescent girls, it will bring negative consequences on growth, school performance, morbidity and reproductive performance. Anaemia leads to fatigue and weakness, pale skin and mucous membranes, rapid heartbeat, irritability, decreased appetite and dizziness or a feeling of being lightheaded.

Anaemia is not a specific entity but an indication of an underlying pathologic process of diseases. There are different types of anaemia

(IAP-2000)

1. Those resulting primarily from decrease in the effective production of red blood cells or haemoglobin.

2. Those in which increased destruction or loss of red blood cells in the predominant mechanism.

According to WHO, iron deficiency anaemia can be managed by increasing iron intake, such as dietary diversification including iron rich food and enhancement of iron absorption, food fortification and parenteral therapy.

Every treatment is costly and may require hospitalization except dietary management. There are different forms of dietary source of iron such as cereals, pulses, green leafy vegetables and animal source such as livers, fish etc. Green leafy vegetables are the cheapest and easily available sources of iron. The uses of amla maintain healthy immune response and improve the haemoglobin level. It is useful in anaemia, jaundice and haemorrhagic disorders.

Different studies show that anaemia is also common in adolescent girls and lead to several complications. This can be prevented by dietary modification with amla and dates. An adolescent girl, who takes amla, improves iron absorption and dates, which are a good source of iron, promotes the anaemia status of the adolescents.

Nursing research, which looks for cheap sources of nutritional diet, is useful for the least privileged. So, it is imperative to find out low-cost and easily available food items in improving the anaemic status.

SIGNIFICANCE AND NEED FOR THE STUDY

Anaemia is a global public health problem affecting both the developing and the developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. In 2002, iron deficiency anaemia (IDA) was considered to be among the most important contributing factors to the

global burden of disease .By far, the most frequent cause of nutritional anaemia is iron deficiency.

World Health Organization and UNICEF reported that anaemia is one of the most widespread public health problems, especially in the developing counties and has important health and welfare, social and economic consequences. These include impaired cognitive development, reduced physical work capacity and in some cases increased risk of mortality, particularly during the prenatal period. There is also evidence that anaemia may result in reduced growth and increased morbidity.

Shanti Ghosh, (2004) stated that Iron deficiency anaemia is the most wide-spread micronutrient deficiency in the world affecting more than a billion people. Anaemia is a serious concern for young children and adolescents because it can result in impaired cognitive performance, behavioural and motor development, co-ordination, language development and associated with increased morbidity from infectious disease.

Global incidence

Nutritional anaemia, due to iron deficiency, is the most prevalent nutritional problem in the world today. The World Health Organization (2008) estimated that about 40% of the world's population (more than 2 billion individuals) suffers from anaemia. The groups with the highest prevalence are: pregnant women and the elderly, about 50%; infants and children of 1-2 years, 48%; school children, 40%; non pregnant women, 35%; adolescents, 30-55%; and pre-school children, 25%.

Professor David Moreley (2009) stated that anaemia is one among the top ten causes of death in childhood. The nutritional requirements of the adolescent are

influenced primarily by the normal event of puberty and simultaneous spurt of growth. Puberty is intensely an anabolic period with increase in height and weight, alteration in the body composition resulting from increased lean body mass and change in the quantity and distribution of fat and enlargement of many organ systems. Adolescents are particularly susceptible to iron deficiency anaemia with increased need for dietary iron for haemoglobin and myoglobin synthesis during the rapid growth period when blood volume and muscle mass are increasing.

Incidence in the developed and the developing countries

The prevalence of anaemia in the developing countries is about four times that of the developed countries. Current estimates for anaemia in the developing and the developed countries respectively are: for pregnant women, 56 and 18%; school children, 53 and 9%; preschool children, 42 and 17%; and men, 33 and 5%. [Accessed from http//www.anaemia.org/prevalence on 20.9.2011].

The WHO (2008) has suggested the following classification of countries with respect to the level of public health significance of anaemia: a prevalence of <15% is "low", 15-40% is "medium" and >40% is "high". Asia has the highest rate of anaemia in the world. About half of the world's anaemic women live in the Indian sub-continent and 88% of them develop anaemia during pregnancy. The situation in Asia has not improved in the recent years.

India

Iron deficiency is the most prevalent nutritional deficiency in the world, and probably the most important micronutrient deficiency in India, where 69.5% of children in the age group of 6 to 59 months are suffering from anaemia of which 63%

are in the urban areas and 71.5% in the rural areas. While 56% of adolescent girls are anaemic, boys too are falling prey to the disease. In a review of 32 studies from the developing countries, about one third of the adolescents were reported anaemic, and in some studies, the prevalence was higher among boys. In India, in many states, prevalence of anaemia in girls is reported as around 70% and a few studies about boys show that around 60% or more are affected. [Accessed from http//www.anaemia.org-childrenhealth/ on 20.9.2011].

Two billion people all over the world are affected by anaemia (WHO-2006). In India alone depending on age and sex, iron deficiency has been reported to be 38.72%, majority of them being women and children. Of the total population, adolescent girls form 22% and estimates suggest that about 25-50% girls become anaemic by the time they reach menarche.

The National Family Health Survey (NFHS-3) conducted a study in 2005-2006 and presented the statistics that mark a growth in cases pertaining to anaemia. Most of the anaemic patients, especially women, suffer from mild to severe deficiency of iron. The haemoglobin count in most of the adolescent girls in India is less than the standard 12gm/dl, the standard accepted worldwide.

Dr R S Chatterjee, Senior Consultant of Rockland Hospital, New Delhi said that, Iron Deficiency Anaemia (IDA) is the most prevalent form in India, but “Lack of consciousness among women aggravates the situation, as now a day, they attach more importance to losing weight.

Dr Anand Mohan of All India Institute of Medical Sciences (AIIMS), New Delhi said, “While heavy menstrual bleeding in adolescent girls causes anaemia,

intestinal worms and intake of mildly toxic elements like paint and mud by children, also facilitate the disease". His words are all the most significant in the context of the NFHS report that shows prevalence of anaemia in children in India is as high as 79%.

Other States

Bulliyy et al. (2008) found 96.5% prevalence among non-school going adolescent girls in three districts of Orissa, of which, 45.2%, 46.9%, and 4.4% had mild, moderate and severe anaemia respectively.

Toteja GS et al. (2009) found 90.1% prevalence of anaemia among adolescent girls from 16 districts of India, with 7.1% having severe anaemia. In this study, a significant association of anaemia was found with socio-economic status, which may be due to the availability of high quality food with better socio-economic status. A significant association of the prevalence of anaemia with educational status of parents reflects better awareness among literate mothers, as well as better socio-economic conditions.

Tamilnadu

Dr Rajaratnam Abel (2009) said, " Following early childhood (<2years), during the adolescent growth spurt, the risk of iron deficiency and anaemia reappears for both boys and girls, after which it subsides for boys but remains for girls because of menstrual blood loss. Iron deficiency affects the ability of adolescents to read, write and learn also". The prevalence of anaemia is 44.8% with severe anaemia being 2.1%, moderate 6.3% and mild anaemia 36.5%. This indicates the importance of including adolescents in the risk groupto improve their iron status and the need for planning intervention programs that would increase the haemoglobin levels among

adolescent girls through prophylaxis treatment, dietary modification and helminthic control. Increasing the educational level of rural girls would also ensure safe motherhood.

Iron deficiency anaemia can affect school performance. Low iron level is an important cause of decreased attention span, reduced alertness, and learning difficulties, both in young children and adolescents. [Accessed from http//www.christieclinic.com/patients/health-and-wellness on 25.6.2011]

Iron deficiency of dietary origin seems to be indicated by dietary intake data, with iron being the single nutrient deficient in the diet, along with energy (Gomber, 1998). So, dietary management to improve iron status by promoting diets with adequate bio available iron, is having an important role in improving anaemia. Main sources of iron in the Indian diets are cereals, pulses and green leafy vegetables.

The economic condition of a vast majority of our population is so poor that they are in no position to afford even the least expensive balanced diets (Dr.S.Parvathy, 2001).

School-age children typically have the highest intensity of worm infection in any age group. For girls and boys aged 5 to 14 years in the low-income families, intestinal worms account for an estimated 11 and 12%, respectively, of the total disease burden, and represent the single largest contributor to the disease burden of this group. An estimated 20% of disability adjusted life years lost because of communicable disease among school children is a direct result of intestinal worms.

Regular deworming contributes to good health and nutrition for children of school-age, which in turn leads to increased enrolment and attendance, reduced class repetition and increased educational attainment. Deworming improves the iron absorption. [Accessed from http://www.schoolsandhealth.Org/Pages /Whydewormthroughschools. aspx on 22. 10. 2011].

Amla is proudly known as 'Indian Gooseberry' and scientifically called as Phyllanthus emblica. It is exceptionally a rich source of Vitamin C and powerful anti-oxidant an amount of 100 gm. of Amla contains about 700 mg. of Vitamin C, which is thirty times the amount found in oranges. Amla powder is used to increase haemoglobin level and raise the red blood cell count.

Dates are scientifically named as Phoenix dactylifera, an excellent source of iron, containing 10.6 mg/100 mg of fruits (about 11% of RDI). Iron, being a component of haemoglobin inside the red blood cells, determines the oxygen carrying capacity of the blood.

Nurses play a vital role in preventing iron deficiency anaemia among underprivileged population of India. Nursing research which looks for cheap sources of nutritional diet is useful for the least privileged. So it is necessary to find out low-cost and easily available food items in improving the anaemic status. Since not much studies are done on dates with amla powder which is the best and cheap source, rich in iron and Vitamin C, the researcher wants to confirm the effectiveness of dates with amla in improving the anaemic status in adolescent girls and it is also to be used for all other groups. Dates containing 10.6 mg / 100mg and amla containing 700 mg / 100mg of iron are used in this study to evaluate effectiveness in improving the anaemic status.

STATEMENT OF THE PROBLEM

An experimental study to evaluate the effectiveness of intake of dates with amla on anaemic status, among adolescent girls with anaemia in a selected residential school at Madurai.

OBJECTIVES

- To assess the level of anaemic status before and after the administration of amla and dates, among the experimental group of adolescent girls with anaemia.
- To assess the pre-test and post-test levels of anaemic status among the control group of adolescent girls with anaemia.
- To evaluate the effectiveness of the intake of dates with amla on the anaemic status among adolescent girls with anaemia.
- To find out the association between the post-test anaemic status of adolescent girls with anaemia and selected demographic variables such as age, education, type of diet, income of family and parental education.

HYPOTHESES

1. The mean post-test anaemic status of adolescent girls who had dates with amla will be significantly higher than their mean pre-test anaemic status of adolescent girls.
2. The mean post-test anaemic status of adolescent girls in the experimental group who had dates with amla will be significantly higher than the mean post-test anaemic status of adolescent girls in the control group.
3. There will be significant association between anaemic status of adolescent girls and selected variables (age, education, type of diet, income of family, parental education.)

OPERATIONAL DEFINITIONS

Effectiveness

It refers to the outcome of administering dates with amla on anaemic status among adolescent girls which will be measured through estimation of haemoglobin by cynmet haemoglobin estimation method and monitoring the anaemic status by using check-list. It is the difference in the mean post-test anaemic status score between the experimental and the control groups.

Amla

Indian gooseberry(phyllanthus emblica), is a very rich source of Vitamin C which helps in the iron absorption that increases the haemoglobin level in blood. For an adolescent, everyday 4gm of amla fruit powder will be provided. (Morning 1/2teaspoon and evening 1/2teaspoon)

Dates

Dates (phoenix dactylifera) are the high rich iron sources which help to increases the haemoglobin level in the blood. Adolescent with 50gm of dates everyday will be provided. [Morning -30gm (3 pieces) and Evening 20gm (2 pieces)]

Anaemia

Anaemia is defined as a haemoglobin concentration lower than <12 gm/dl. in adolescents. Iron deficiency anaemia is a condition caused by lack of sufficient iron for the synthesis of haemoglobin. Anaemia is characterized by pale palpebral conjunctiva, pallor of tongue, pallor of nails, pallor of palms and soles, shortness of breath, underweight, overweight, fatigue, palpitation anorexia and lack of

concentration by physical assessment and low haemoglobin level less than 12 gm% (WHO) (1992) measured by cynmet haemoglobin method.

In this study adolescents with haemoglobin estimation of <12gm/dl will be considered.

Anaemic status

It is the deficiency either in quality or quantity of red corpuscles in the blood giving rise to anaemic symptoms.

Normal value in adolescents – Male – 13.5-17 mg/dl, Female – 12-16 mg/dl.

Cynmet haemoglobin method

20 micro litre of blood is added to tubes containing 5 ml of drabkins solutions mixed level and analysed with a photo electric calories meter using optical density as a comparative measure.

Adolescents

Adolescent age is the age group between 13 to 16 years.

ASSUMPTIONS

1. Assessment of iron deficiency anaemia is an important function of the nurse.
2. Early assessment and treatment of iron deficiency anaemia in adolescent girls may help in the reduction of morbidity and mortality.
3. Amla and dates are available for use.
4. Amla enhances the iron absorption.

DELIMITATIONS

1. The study period is limited to a period of 6 weeks.
2. The study sample is restricted to adolescent girls attending school only.

PROJECTED OUTCOME

1. The study findings will help the nursing personnel to confirm the effectiveness of dates with amla in improving the anaemic status.
2. It also directs the nursing personnel to develop an approach to determine the level of anaemic status through physical assessment.
3. It will help the health personnel to conduct further research studies in different areas.

CONCEPTUAL FRAMEWORK

This is based on J.W Kenny's Open System Model. All living organisms are open that, there is a continual exchange of matter, energy and information. Open system has varying degrees of interaction with environment, from which the system receives the input and gives back output in the form of matter, energy and information.

The main concepts of the Open System Model are input, throughput, output and feedback. The Open System theory input refers to energy, matter and information, throughput refers to processing, where the system transforms the energy, matter and information and output refers to the energy, matter and information that are processed. Feedback refers to the environmental responses to the system output used by the system.

In this study, adolescents were suffering with iron deficiency anaemia, before administration of dates with amla. The input was, administering dates with amla to the adolescent girls having anaemia. The throughput was the mechanism by which iron from dates with amla is absorbed and combined with globin to form haemoglobin and the output was that how much effective were dates with amla in improving the anaemic status in the adolescent girls.

CHAPTER-II

REVIEW OF LITERATURE

The primary purpose of reviewing relevant literature is to give broad ground knowledge and understanding of the information that is available, related to the researcher's problems of interest, Polit and Hungler (1999).

According to Polit and Hungler (1999), researchers almost never conduct a study in an intellectual vacuum; their studies are undertaken within the context of an existing base of knowledge. Researchers generally undertake a literature review to familiarize them about the topic under study.

Here the investigator has done the literature review under the following headings.

1. Related to adolescent health
2. Related to overview of anaemia
    - Incidence
    - Causes
    - Pathophysiology
    - Diagnostic evaluation
    - Complications
3. Related to management of anaemia
    - Drugs
    - Iron fortified food
    - Diet
    - Amla and Dates

Literature related to adolescent health

Health problems of adolescents

A significant problem for modern youth globally is the fact that they are bombarded from an early age with social messages having formative effects, particularly at a time of experimentation such as the teenage years. Aggressive marketing targeted at this age group, combined with risk-taking behaviours that youngsters may normally develop as they struggle towards independence, lead to the emergence of new morbidities. These conditions include problems such as accidents, eating disorders, sexually transmitted diseases, unwanted pregnancies, substance abuse, and mental health issues. Although these conditions are not classic medical illnesses, they seriously affect physical and mental adolescent health and result in decreased future productivity and employment opportunities. Of great interest is also the fact that a large number of the problems rising in adolescence can be prevented.

Many severe future adulthood conditions could potentially be diminished by educating and promoting health services of today's adolescents (osteoporosis, mental illnesses, cardiovascular disease, some tumours, and infertility). Iron is a necessary mineral for body function and good health. Every red blood cell in the body contains iron in its haemoglobin, the pigment that carries oxygen to the tissues from the lungs. But a lack of iron in the blood can lead to iron-deficiency anaemia, which is a very common nutritional deficiency among children. [Accessed from http://www.youth-health.gr/en/ healthproblems.php on 24.9.2011].

Anaemia in Adolescents

Adolescence is a "coming of age", as children grow into young adults. These teen years are a period of intense growth, not only physically, but also mentally and

socially. During this time, 20% of final adult height and 50% of adult weight are attained. Because of this rapid growth, adolescents are especially vulnerable to anaemia. Proper nutrition, including adequate iron intake, plays an important part of the teenager's growth and development. During adolescence, teenagers will acquire the knowledge and skills that will help them to become independent and successful young adults. Iron deficiency and iron deficiency anaemia can affect their learning and development, but parents can help their teenagers stay healthy by teaching them some easy ways to prevent iron deficiency. [Accessed from http://www.anemia.org /patients/feature-articles/content.php on 23.9.2011]

Risk of anaemia

Iron deficiency is the most common cause of anaemia among adolescents. In India, an adolescent girl is 10 times more likely to develop anaemia than a boy. Teenagers are at the highest risk of anaemia during their adolescent growth spurt. Among girls, however, menstruation increases the risk for iron deficiency anaemia throughout their adolescent and childbearing years. Boys, on the other hand, are at risk for anaemia only during their adolescent growth spurt. Adolescents in lower-income homes are also at a high risk. However, children from all backgrounds can develop iron deficiency and iron deficiency anaemia.

Risk Factors of Iron Deficiency in adolescents

- Low intake of meat, fish, poultry or iron fortified foods
- Frequent dieting or restricted eating
- Vegetarian eating styles
- Meal skipping
- Chronic or significant weight loss

- Heavy menstrual periods
- Rapid growth
- Participation in endurance sports
- Intensive physical training

Dr. Van Winkle (2009) has stated, "In teenagers, iron deficiency is more than just being pale and tired. It can affect their development and school performance." Studies have shown that adolescents with anaemia have decreased verbal learning and memory, as well as lower standardized math scores. Even before anaemia might develop, iron deficiency can cause shortened attention span, alertness, and learning in adolescents. There is evidence, though, that correcting the iron deficiency may improve learning. A study of adolescent girls with iron deficiency showed that their test scores improved after receiving iron supplements. Fortunately, there are steps parents can take to prevent and treat iron deficiency and iron deficiency anaemia in their kids.

Literature and studies related to overview of anaemia

a) Incidence

Iron deficiency anaemia is a leading cause of morbidity and mortality worldwide (WHO, 2001). Iron deficiency Anaemia is a decrease in the number of red blood cells caused by too little iron. Iron deficiency anaemia is caused by lack of sufficient iron for synthesis of haemoglobin (Marlow, 1998). Iron is an essential component of haemoglobin, the oxygen carrying pigment in the blood. Iron is normally obtained through food and by recycling iron from old red blood cells. Without it, blood cannot carry oxygen effectively. Nutritional anaemia is a disease syndrome caused by malnutrition in its widest sense. It has been defined by WHO as

a condition in which the haemoglobin content of blood is lower than normal, as a result of deficiency.

Cook J.D. (1994), conducted a study and revealed that the prevalence of Iron deficiency anaemia in industrialized countries has declined in recent decades. But there has been a little change in the World Wide prevalence, 1.5 billion people all over the World are affected by iron deficiency anaemia. In India alone, depending on age and sex, iron deficiency anaemia has been reported to range from 38-72 % (Choudhary, P. Vir, S) majority of them being women and children.

Kalamka H.S. (2001), conducted a study on iron deficiency anaemia in Nagpur. Out of 700 adolescents, 401(57.28%) were anaemic, with 117 (16.71%) having moderate and 284(40.57%) having mild anaemia. Higher prevalence of anaemia was seen in 219(60.16%) female adolescents as compared to 182 (54.16%) male adolescents.

Tuhina Verma et. al. (2002), revealed that more than 700 million persons in the world suffer from iron deficiency anaemia and about thrice the number from iron deficiency status.

Hashizume, Masahiro (2005), conducted a study to investigate prevalence of anaemia and iron deficiency and Vitamin A status among school going adolescent children in rural Kazakhstan. Among the 159 children, the prevalence of anaemia and iron deficiency defined by the multiple criteria model (SF, TS and EP) was 2 7% and 13% respectively. Nine percent had iron deficiency anaemia and 21%had serum rational value<1.5 Micro mole 1-1

Rebecca J. Stoltzfus, et al., (2005), conducted a study on epidemiology of iron deficiency anemia in Zanzibari school children. Iron status was assessed by haemoglobin, erythrocyte protoporphyin (E.P) and serum ferritin concentration from venous blood sample of 3595 school children from pemba Island, Zanzibari. The study revealed that overall, 62.3% of children were anaemic (haemoglobin <110g/c) and 82.7% anaemia was associated with iron deficiency.

Jeffrey M. Kaczorowski et al., (2006), conducted a study on iron deficiency among school aged children in U.S.A. Among the 5398 children between the ages of 6-16 years included in the sample, 3% had iron deficiency anaemia. The prevalence of iron deficiency was common among females, with total prevalence of 7% between the ages 12 to 16 years.

Nelly Zavaleta Pimentel et. al., (2008), conducted a study on anaemia and iron deficiency in adolescent students in Lima, Peru. The study revealed that among 88 samples, 25% of school age adolescent girls were anaemic in Lima and in Peru 10% of the study population was anaemic with upto 20% anaemic in the public school population.

Verma,M.J. (2008) conducted a study to assess the prevalence of anaemia among urban school children of Punjab. Relevant history was taken and haemoglobin was estimated using cynmet haemoglobin method and peripheral blood smear was also examined. Anaemia was diagnosed when haemoglobin was less than 11 gm/ d1 for children of 5-6 year and 12 gm / dl for more than 6 years. Overall prevalence of anaemia was 51.5%. Girls had a significantly higher prevalence of anaemia excepted at 5 years and 10-12 years of age. More menarchial girls were anaemic as compared

to non menarchial ones. The prevalence of anaemia was high (38%) even in higher socio-economic groups.

b) Causes

According to Marlow (1998), the major causes for iron deficiency anaemia are

i. Insufficient supply at birth
ii. Insufficient intake during period of rapid growth
iii. Impaired absorption
iv. Blood loss

Penclope Nestel and Lene Davisson (1996) stated that anaemia is caused by deficient iron, specific nutrient deficiencies such as vitamin A, B-6 and B-12, riboflavin and folic acid, general infections and chronic diseases including HIV / AIDS as well as blood loss. The risk of anaemia increases when individuals are exposed to malaria Eg: plasmodium falciparum helminthic infections such as hookworms, trichuris trichuria, schistosoma haematobium and schistosoma mansoni.

Shanti Ghosh (2004) from her studies identified causative factors such as poor dietary iron intake, delayed introduction and poor quality of weaning food and over reliance on milk. The prevalence of intestinal parasitic infestation is high in urban slum children between 10 and 16years and it had limited or no role in the causation of anaemia.

Intestinal helminthic infestation is one of the causes of iron deficiency Anaemia (Kazara 2005). Dr. Gita Mathai, (2005) said that 15% of population of young children have parasitic infestation. The worms attach themselves to the intestines and causes mal-absorption and anaemia.

Laxmiah, A., et al., (2006), conducted a study to assess the nutritional status of adolescent in Punjab and concluded that in spite of the reported high rates of economic growth and food production in the state, a higher proportion of adolescents were consuming diet which are inadequate with respect to energy, fat, iron, riboflavin A and Vitamin C.

Hababu, M. Chwaya, et al., (2006) conducted a study on the importance of hook worms and revealed that infection with malaria, trichuris, drichuria, ascaris lumbricoides and hook worms was all associated with large iron status. The association with hook worms was strongest by far. In multivariate analyses, hook worm infection intensity was the strongest explanatory variable for haemoglobin, EP and Serum ferritin. Twenty five percent of all anaemia, 55% of iron deficiency anaemia and 73% of severe anaemia were attributable to hookworm infection and 10% of anaemia was attributable to a Lumbricoides, malaria infection or stunting.

In another study done by Dheeraj Shah (2007), it was found that children born to mothers who were illiterate or who belonged to schedule caste/ tribes were more likely to be anaemic than their counter parts. Further children born to moderately and severely anaemic mothers were more anaemic themselves, reflecting the consequences of poor maternal health status on the health of children.

A current study at Lucknow revealed that majority of the children was found to be malnourished and also anaemic. The point prevalence of intestinal parasites was 17.5% and that children with parasitic infestation had lower haemoglobin than the non-infested children (S. Aswathi, 2007)

Some dietary beliefs and practices such as prolonged breast feeding and last weaning were also causes for iron deficiency in children (Gomber, S. Kumar, 2008). In another study done by Verma, M. (2008), it was revealed that vegetarians and girls especially after menarche were more at risk to develop anaemia.

ICDs project, Delhi conducted a study to assess the iron status of adolescents in the urban slum and concluded that iron intake on an average was approximately one-third of the recommended dietary allowances and approximately 98% of the children had an intake below recommended dietary allowance. The iron density was found to be 0.008 mg/unit calories almost 20% less than the recommended (ICMR 2009).

b) Pathophysiology

Iron is an essential mineral that is needed to form haemoglobin, an oxygen carrying protein inside red blood cells. A decrease in iron amounts in the body may be caused by poor intake of iron-rich foods, prolonged bleeding or intestinal disorders that prevent iron absorption.

Iron deficiency anaemia is the most common form of anaemia and it develops over time if the body does not have enough iron to manufacture red blood cells. Without enough iron, the body uses up all the iron it has stored in the liver, bone marrow and other organs. Once the stored iron is depleted, the body is able to make very few red blood cells. The red blood cells the body is able to make are abnormal and do not have a normal haemoglobin-carrying capacity, as do normal red blood cells.

Iron depletion progresses in stages:

stage 1 - Storage levels decrease in the liver, spleen and bone marrow. Low serum ferritin levels are seen.

stage 2 - A decrease in serum iron and an increase in the total iron binding capacity (TIBC) is seen, resulting in decreased transferrin saturation.

stage 3 - Low haemoglobin production occurs, accompanied by increased RBC protoporphyrin. Microcytic anaemia in the blood soon follows.[Accessed from http://www.livestrong.com/article/373054-the-pathophysiology-of-iron-deficiency-anemia/ on 15.9.2011].

Three stages of iron deficiency have been described. The initial stage, iron depletion, occurs when stored iron in the bone marrow diminishes due to insufficient supply of iron. Generally this stage is asymptomatic and creates no overt effect on erythropoiesis and escapes detection by haemoglobin or haematocrit screening. Continued iron store depletion leads to the second stage iron deficiency, during which storage levels become substantially reduced and haemoglobin synthesis begins to be affected. The final stage iron deficiency anaemia, develops when iron stores are insufficient to maintain haemoglobin production. This advanced stage will be reflected in low haemoglobin and haematocrit values (Lesperance et al., 2002; Wu et al., 2002). It is important for the practitioner to understand that by the time low haemoglobin or haematocrit levels are discovered on routine screening, the iron stores have been significantly depleted and will need replenishment.

In order to prevent iron deficiency infants and children need to absorb approximately 0.8 milligrams of dietary iron per day to support normal growth and

replace normal physiological losses (Behrman, Kliegman and Arvin, 1996; Wu et al., 2002). Most dietary iron sources are non heme, which limit their bioavailability or absorption to approximately 10% of that ingested (Behrman et al., 1996; Dudek, 2001). Supplemental iron recommendations must account for this limitation in absorption.

d) Diagnostic evaluation

Diagnostic Evaluations of Iron Deficiency Anaemia (IAP-2003)

1. Low haematocrit and haemoglobin levels
2. Low red blood cells
3. Low serum ferritin
4. Low serum iron levels
5. High iron binding capacity
6. Blood in stool (Microscopic)

Carrlo Brugnara (2009) conducted a study to develop an effective approach for diagnosis of iron deficiency anaemia in adolescents and concluded that the reticulocyte haemoglobin content and haemoglobin levels were the only significant predictors of Iron deficiency anaemia

e) Complications

Soemantri, A.G., et al (1999) conducted a study on iron deficiency anaemia and educational achievement among adolescents and showed that Iron treatment for 3 months period resulted in substantive increases in mean Hgb, Hcl and trans ferritin saturation among iron deficient anaemic children. Furthermore, changes in the iron status of iron deficient anaemic children were associated with significant changes in

the school achievement test scores of iron deficient anaemic children. Transferritin2 evaluation of achievement test scores indicated that the difference between iron treated anaemic and non-anaemic children was still statistically significant. Iron supplementation among iron deficient anaemic children benefits learning processes as measured by the school achievement test scores.

Iron deficiency anaemia has various health impacts on children and adolescents. In May 2000, a meeting commissioned by World Health Organization and International Nutritional Anaemia Consultation Group and Edna MC Connell Clark foundation, systematically reviewed the evidence of a causal relationship between iron deficiency anaemia and four health outcomes namely, child mortality, birth outcomes morbidity, works productivity and child development (Beard and Shotgun, 2001).

There is substantial body of evidence that iron deficiency decreases fitness and aerobic work capacity through mechanism that includes oxygen transport and respiratory efficiency within the muscle (Beard-2001).

Beaton G.H. (2002) has concluded in his study that there is a causal relationship between iron deficiency in early childhood and intelligence in mid-childhood.

Vrtms, M. (2005), said that there is convincing evidence that iron deficiency causes impaired growth, developmental delay, behavioural abnormalities and impairs cognitive function and school performance. It also includes functional abnormities of lymphocytes and neutrophils.

Ho Kamea T. et al., (2005), conducted a developmental test to evaluate the effect of iron deficiency anaemia in child development by using Bailey Scale of infant development and Enjoji scale of infant analytical development. The mental developmental index of infants with anaemia and infants with a history of anaemia were lower than that of the control group.

Jill S. Halterman (2006), conducted a study on iron deficiency and cognitive achievement among school aged children and adolescents in the united states. The study concluded that they demonstrated lower standardized math scores among iron deficient school aged children and adolescents including those with iron deficiency without anaemic, compared with children with normal iron status.

Cook et al., (2006), has shown an increased lead absorption associated with iron deficiency. This is because lead replaces iron in the absorptive pathway when iron is unavailable.

Children with iron deficiency anaemia are more susceptible to infections due to reduced immunity. Iron deficiency has detrimental effects on growth and development, cognitive development, motor development and behavioural development. It can cause a loss of 9 I.Q. points. It slows brain function, hurting co-ordination and motor skills. Iron is critical for child development. [Accessed from http//www.anaemia.org/childhealth. on 24.9.2011]

Literature and studies related to Management of Anaemia

Stanley Slotkin (2003) has given three major strategies of management such as dietary modification, food fortification and iron supplementation.

a) Drug

In India steps have been taken to control iron deficiency anaemia among school age children, adolescent girls and pregnant women by distribution of ferrous sulphate and folic acid tablets (Ministry of Health and family Welfare1991).

The efficiency of recombinant human erythropoietin (r Hu EPH) in correcting anaemia in uraemia patients is now widely recognized (Bernard Canand et al.,1995).

There are four different intravenous iron preparations, iron dextran, iron sucrose, iron gluconate and iron dextrin. (Mac dougall Ic.1997). In all these, there is the danger that iron will be released too rapidly and may result in free iron reactions which are anaphylactic in nature (Zaien et., 1996).

The Federal Centres Of Disease Control recommend 3 months course of therapy (Ferrous Sulphate) for treatment of iron deficiency anaemia. They advise patients to continue iron supplements for 6-12 months and also it is important that they add more iron in the form of iron rich foods in the diet and that the doctors treat any correctable cause of blood loss (CDc 1998).

Anshu Sharma, et al, (1999) conducted a study on identification of an appropriate strategy to control anaemia in adolescent girls of poor communities and showed that 61.9% of the subjects in the urban and 85.4% in rural areas were anaemic. The response of Hb levels to daily iron/ folate supplementation was better in comparison to once in a week supplementation. The increment in Hb levels of subjects due to the addition of Vitamin C to iron / folate supplementation was more than that with supplementation of iron / folate alone. But they concluded that considering compliance, feasibility and cost factors, a public health approach

consisting of once weekly distribution of iron / folate supplemented through school and welfare centres is better and can be recommended as appropriate strategy for combating anaemia in adolescent girls of poor communities and the developing countries like India.

Agyei, Frempong et al., (2003), conducted a study to compare the prevalence of iron deficiency anaemia among Ghanaian children and to see whether 200 mg ferrous fumerate B.P could correct iron deficiency anaemia and showed that following a 30 day administration of ferrous fumerate the mean serum iron for the rural children increased significantly by 3.3 micromole / I and concluded that iron supplements like 200 mg ferrous fumerate for thirty days can substantially improve the iron status of iron deficient children.

Odef Muller (2005), conducted a study and revealed that iron supplementation of anaemic school children improves their school performance, verbal and other skills. Iron supplementation of Israel girls aged 16-17 years reduced tiredness and improved their ability to concentrate. In U.S.A, iron deficient but non-anaemic girls aged 13 to 18 years had better verbal learning and memory abilities after 2 months of iron supplementation in a randomized controlled trial. In India, boys and girls aged 6-12 years improved their, cognitive function after iron supplementation.

Seizenberg et al., (2005), conducted a study and revealed that the role of ascorbic acid in iron metabolism is many fold as it reduces ferric iron to ferrous iron, from which is than absorbed, lowers pH, which is conducive to iron absorption.

Graciela Raspicio Torres, et al., (2006), conducted a study to assess the efficacy of iron supplements administered as an intermittent dose to adolescent girls revealed

that the 296 girls who received the supplement had significantly a higher haemoglobin level then girls in the placebo group. And girls who had taken daily iron supplement had significantly ($p<0.05$) higher haemoglobins than those in the intermittent group.

a) Iron Fortified Food

The internal life sciences institute focal point in China (2002) and Institute Of Nutrition And Food Hygiene Of Chinese Academy of Preventive Medicine sponsored food fortification in China in line with NaFe EDTA (Sodium from ethylene diamine tetra acetic acid). The haemoglobin levels of the state consuming soya sauce fortified with 5 mg and 20 mg of iron were significantly increased and the anaemia eliminated.

Regular conception of iron fortified fish sauce significantly reduced this prevalence of iron deficiency anaemia in Vietnamese women during six months intervention (Bernard, 2003). Diklar et al., (2003), fortified orange flavoured beverage with iron to reduce the prevalence of iron deficiency anaemia, for six months to improve the growth in addition to increase in iron status among school age children.

Newly triple fortification of salt that developed microcapsules containing iodine, iron and Vitamin A are highly effective when added to local African salt. Triple fortification of salt was highly efficacious in reducing the prevalence of iron, iodine and vitamin A deficiencies in adolescents (Dallman, 2004).

Dual fortification of salt containing iodine and encapsulated iron can be an effective fortification strategy to reduce the prevalence of anaemia (Oday Muller, 2005).

Similarly, the Council for Agricultural Science and Technology (2005), has succeeded in introducing genes that increases the available iron level in rise to three fold. This is a potential remedy for iron deficiency, a condition that affects more than 2 billion people (Council for AST).

Simous Mc et al., (2005), in his study has evaluated the impact of haematinic iron rich nutrition supplement in correcting iron deficiency anaemia. He has showed that the serum iron and iron retention capacity in the study group is higher than the control group. Iron rich foods include raisins, meats (liver is the highest source), fish, poultry and eggs. Chunmug, C. (2005) in his study confirmed the effectiveness of iron fortified soya sauce in correcting iron deficiency anaemia.

Moretti, et al., (2006) conducted a study to determine extracted rice grains fortified with micronized ground ferric pyrophosphate (MG FP) would increase body iron stores in children and adolescents. He revealed that there was a significant increase in body iron stores in the study groups. That is increased from 30% to 45% and concluded that extracted rice fortified with MG FP has excellent sensory characteristics.

Rockfeller foundation is sponsoring research using biotechnology in rice in designing “Golden Rice” to build vitamin A and second phase of it will increase the iron content in rice to combat anaemia. [Accessed from http//www.childrenshealth.com/herbal/ on 19.10.2011]

b) Diet

Seasonal green leafy vegetables and fruits are rich sources of iron and are easily affordable. These will provide iron enhanced for absorption and vitamins.

Varma, A. et al., conducted a study to determine the factors influencing anaemia among girls of school age from slums of Ahmedabad city and found that prevalence of anaemia was significantly lower in girls consuming green leafy vegetables. In addition, cooking in cast iron utensils will improve dietary iron intake (Lal H Agarwall, 1973). Bach Kristensen (1980), has confirmed in his study that even post meal increases iron absorption.

Even though the non-haeme iron, is not easily absorbed, if iron-rich food taken on a daily basis, will be beneficial. Hall berg in his study confirmed that highest absorption of non-haeme Iron (0-98 mg) was seen from a vegetarian meal with a high content of ascorbic acid (Hallberg, 1982).

Iron supplementation improves the efficiency of iodized salt in goitres children with iron deficiency. A high prevalence of iron deficiency among children in areas of endemic goitre may reduce effectiveness of iodine prophylaxis (Sonja. 2002).

The most effective long-term strategy is to increase the intake of bioavailable iron in the diet. The customary approach has been to fortify a staple food such as wheat, rice, sugar or salt and thereby increases the iron intake of entire population (Cook J.D, 2004).

Beulah (2006), conducted an experimental study on effectiveness of ragi porridge in correcting iron deficiency anaemia among school age children at selected child care home in Madurai and revealed a remarkable increase in haemoglobin level. Mean haemoglobin level after administration of ragi porridge in the experimental group was higher (10.9) than mean haemoglobin level before administration of ragi porridge (9.9).

Food-based solutions to iron deficiency anaemia are the most sustainable, cheap and desirable method. They are designed to increase the intake through diet. There are two types of iron that is absorbed from food-haeme and non-haeme iron. Haeme iron found in animal food, is easily absorbed whereas non-haem iron from plant food is less absorbable.

Home treatment for iron deficiency as recommended in the health guide includes, intake of iron-rich foods like meat, egg and whole grain cereals. Being high in iron, bananas can stimulate production of haemoglobin in blood and so helps in cases of deficiency anaemia. [Accessed from http.www.healthguide.com//html on 12.9.2011].

c) Amla and dates

Amla (Phyllanthus emblica) is used to treat anaemia. Anaemia is a condition which is caused due to lack of blood in the body. It's a common disorder in these days. The amount of red blood cells (RBC) is reduced in the body. RBC contains haemoglobin. Iron is essential in the formation of haemoglobin. Amla is a rich source of iron and Vitamin C. Vitamin C helps in the absorption of iron. Amla supplements can be effectively used to treat iron deficiency anaemia. Studies have shown that amla is a good source of iron. Use of amla treats the iron deficiency anaemia effectively.

AMLA is proudly known as 'Indian Gooseberry'. It is exceptionally a rich source of Vitamin C and powerful anti-oxidant 100 gm. of Amla contains about 700 mg. of vitamin C, which is thirty times the amount found in oranges. [Accessed from http//www.kanhaiyaamla.com/nutritionhtml on 12.9.2011].

PREVENTIVE AND IMMUNITY ENHANCING, ANTI-AGING USES OF HEALTH FOOD: AMLA POWDER

1. Cough, Bronchitis, Asthma, Intermittent fevers
2. Hyperacidity, Bilious vomiting, Gastritis
3. Ulcer, Jaundice, Hepatitis
4. Haemoglobin, Red blood cell count, Anaemia
5. Cholesterol, Hypertension, Cardiac disorders
6. Diabetes
7. Ophthalmopathy, Cataract
8. Rheumatism, Osteoarthritis
9. Diarrhea, Dysentery
10. Gonorrhea, Spermatorrhea,
11. Sexual rejuvenation
12. Scurvy, Bleeding gums
13. Cancer
14. HIV
15. Heavy metal poisoning

RECOMMENDED DOSES: **Daily intake of dietary Vitamin C**

(According to U.S. RDA), are listed below:

Infants	age below 1 year	: 30 to 35 mg
Children	age 1 to 14 years	: 40 to 50 mg
Adolescent	age 15 to 18 years	: 65 to 75 mg
Men	age over 18 years	: 90 mg
Women	age over 18 years	: 75 mg

In accordance with the above chart, as a HEALTH FOOD AND BEST DIETARY SUPPLEMENT, about one teaspoonful of Vitamin C rich, quality Amla Powder is sufficient for enhancing general immune system. Only Quality Amla Fruit Powder contains over 3000 mg of vitamin C in 100 gm of powder.

Dates (Phoenix dactylifera) are an excellent source of iron, contains 0.90 mg/100 g of fruits (about 11% of RDI). Iron, being a component of haemoglobin inside the red blood cells, determines the oxygen carrying capacity of the blood.

Jenny Dean MS RD (2005), nutrition specialist with Marr Barr Communications and member of the Board of Directors of the Colorado Dietetics Association, said that, "Ascorbic acid, Vitamin C and other organic acids in fruits and vegetables enhance iron absorption even in the presence of phytates."

Just as iron absorption is enhanced by the presence of Vitamin C, it is also sensitive to the presence of inhibitors that prevent it from being absorbed by the body. Tannin, found in tea and cola drinks, is a major inhibitor. Research has firmly established the large role played by tannins in preventing the assimilation of iron- the tannic acid in tea reduces iron absorption by as much as 50%. Although lemon added to tea might help in reducing the inhibiting properties of tannic acid, it is best to avoid tea and cola drinks when taking iron rich foods. [Accessed from http//www.anaemia.org/childhealth html on 12.9.2011]

Fruits rich in iron include dried apricots, avocadoes, currants, raisins, dates, figs and prunes. One cup of dates has as much as 5.3 milligrams of iron- about 29% of the RDA for women.

RECOMMENDED DAILY ALLOWANCE FOR IRON

Recommended Dietary Allowances for Iron for Infants (7 to 12 months), Children and Adults

Age	Males(mg/day)	Females(mg/day)
7 to 12 months	11	11
1 to 3 years	7	7
4 to 8 years	10	10
9 to 13 years	8	8
14 to 18 years	11	15
19 to 50 years	8	18
51 years and above	8	8

NUTRIENT CONTENT OF DATES AND AMLA / 100MG

NUTRIENT	DATES	AMLA
Energy	283 Cal	58 Cal
Protein	3gm	0.5gm
Fat	0.2gm	0.1gm
Carbohydrate	67.3gm	13.7gm
Calcium	0.07gm.	0.05gm
Iron	10.6mg	1.2 mg
Vitamin C	0	600 mg

This chapter dealt with the review of literature related to the problems area of the study.

CHAPTER -III

RESEARCH METHODOLOGY

The methodology of research indicates the general pattern of organizing the procedures for gathering valid and reliable data for an investigation.

This includes research approach, research design and the study setting. It further deals with the development of tool, procedure for data collection and plan for data analysis.

For every piece of research work, the methodology of investigation is of vital importance. The success of any research depends upon the suitability of the method, the tools and techniques that the researcher follows to gather adequate data.

RESEARCH APPROACH

Phase -1 survey approach was used for the present study.

According to Polit 2008, A survey approach is designed to obtain information about the prevalence, distribution and interactions of variables within a population.

Phase-2 experimental approach was used for the present study.

According to Polit 2008, experimental approach is the study to explore the dimension of a phenomenon or to develop a definite hypothesis and about the relationship between phenomenon. This approach was used to determine the effectiveness of intake of dates with amla on anaemic status among adolescent girls with anaemia.

RESEARCH DESIGN

Pre-test – post-test non-equivalent control group quasi experimental design was to be adopted for the study.

Pre-test – post-test designs are an expansion of the post-test only to design with non-equivalent groups, one of the simplest methods of testing the effectiveness of an intervention.

In this design, which uses two groups, one group is given the treatment and the results are gathered at the end. The control group receives no treatment, over the same period of time, but undergoes exactly the same tests.

Pre-test			**Post-test**
Group 1.	O1	X	O2 (experimental group)
Group 2.	O3		O4 (control group).

Intervention X – giving amla with dates to improve the anaemic status of adolescent girls with anaemia.

O1- pre-test experimental group

O2- post-test experimental group

O3- pre-test control group

O4- post-test control group.

RESEARCH VARIABLES

Dependent variables: Anaemic status

Independent variables: Administration of amla with dates

SETTING OF THE STUDY

The study was conducted in a Lucy Perry Noble Girl's Higher Secondary School, Rachanyapuram , K.Pudur, Madurai. Total strength of the school is 1500. From 8th std to 11th std, 800 students are studying.

Infrastructure of the school

Lucy Perry Noble Girl's Higher Secondary School, Rachanyapuram, K.Pudur, Madurai is located at the centre of the city. Each standard has sections from A to C. This school has good physical facilities like playground, drinking water supply and toilet facilities. Class rooms are well ventilated and are under close supervision of the teacher.

Strength of the boarding home

There were two boarding homes inside the school campus namely L.P.N boarding home A and B. In Boarding home A the strength of the students are 175. In Boarding home B the strength of the students are 150. They are supervised by one Head Warden and two assistant wardens of each boarding home. The students were from 6th std to 12th std.

Infrastructure of the boarding

Lucy Perry Noble Girl's Higher Secondary School is a helpline school located in Moondrumavadi 5km from Mattuthavani Bus Stand. Students from various villages in and around Madurai are staying in the boarding home. They belong to poor socio-economic and similar background. The boarding home has good physical facilities like dining hall, prayer hall and the study room. All facilities like water, electricity and toilet are good. The rooms are well ventilated.

The school was selected for the study because of the availability of subjects and feasibility of conducting the study.

STUDY POPULATION

The target population of the study were adolescent girls between the age of 13-16 years, studying in 8th, 9th, 10th and 11th standard in selected school at Madurai.

SAMPLE

The study sample was the adolescent girls between the age of 13-16 years who are studying 8th, 9th, 10th and 11th standard in Lucy Perry Noble Girl's Higher Secondary School, Rachanyapuram , K.Pudur, Madurai who fit into inclusion criteria.

SAMPLING SIZE

PHASE-1 - conducting survey on 100 adolescent girls to rule out girls with anaemia.

PHASE-2 - 60 Adolescent girls with the haemoglobin below 12mg/ dl were selected randomly.

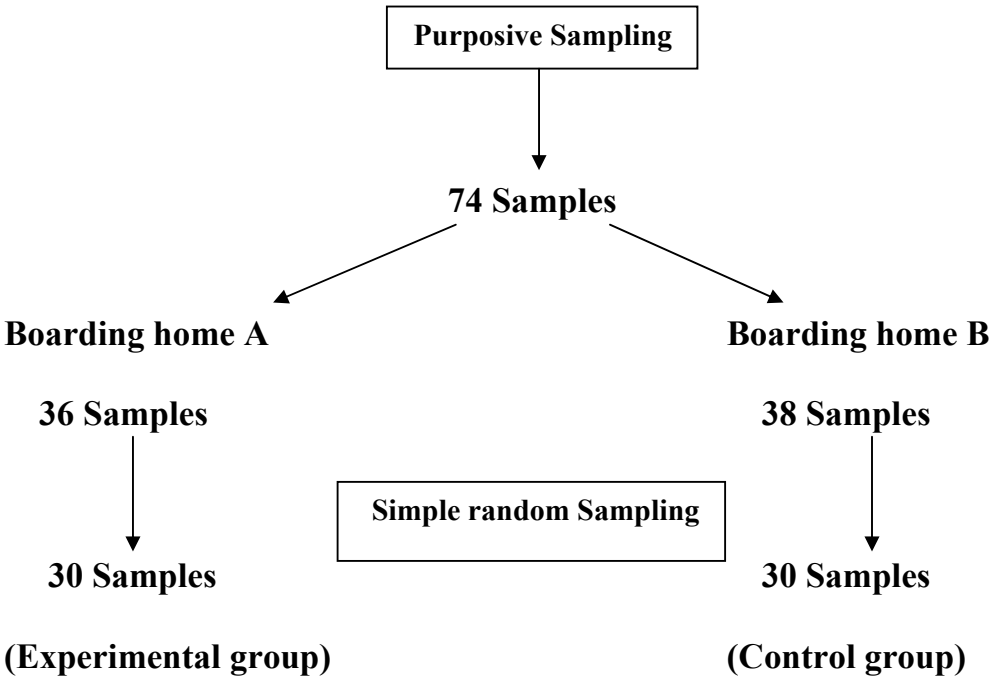
30 samples under experimental group.

30 samples under control group.

SAMPLING TECHNIQUE

Lucy Perry Noble Girl's Higher Secondary School

Boarding home (100 Samples)



CRITERIA FOR SAMPLE SELECTION

Inclusion criteria:

The sample was selected on the basis of the following criteria:

- Age group of 13-16yrs
- Adolescent girls who are anaemic (hb below 12gm/dl)
- Adolescent girls who have attained menarche.

Exclusion criteria:

- Adolescent girls affected with other infections like whooping cough, tuberculosis, bronchopneumonia, gastro intestinal disturbances
- Adolescent girls who were already on treatment with iron and folic acid tablets.
- Adolescent girls who were having irregular menstrual cycle.

RESEARCH TOOL AND TECHNIQUE

The tools used for this study consists of demographic data, checklist regarding the assessment of the anaemic status of adolescent girls and bio physiological approach to estimate the haemoglobin status among school adolescent girls using cynmet haemoglobin method. The tool was prepared after going through related literature and with the guidance of experts in the field.

DESCRIPTION OF THE TOOL

The data collection tool consists of:

Part I: Demographic data

Part II: Checklist regarding the assessment of the anaemic status

Part III: Bio physiological approach to estimate the haemoglobin status

Part I:

Part I consists of the personal data of the adolescents, which includes name, age, education, section, literacy status of the father, literacy status of the mother, income of the family, type of diet, menstrual regularity of cycle, dewormed, any treatment of anaemia, any treatment of thalasimia and leukimia, any other gastro intestinal diseases, previous haemoglobin level, present height and weight, menstrual flow and menstrual length.

Part II:

The checklist consists of 11 items such as symptoms includes (fatigue, lack of concentration, shortness of breath, habit of pica eating, getting irritated often, palpitation, anorexia) signs includes (palpebral conjunctiva, pallor of tongue, pallor of the nails, pallor of palm and soles, growth retardation) for assessing the anaemic

status of adolescent girls. The checklist consists of mild, moderate and severe anaemic characteristics. A score of 1 was allotted for each mild and moderate characteristic feature and a score of 2 was allotted for each severe characteristic feature.

Scoring interpretation

Score

Total score is 18. Based on the scores obtained the subjects were arbitrarily grouped into 3 groups as below:

1-6(20-40%): Mild anaemic status

7-11(50-70%): Moderate anaemic status

12-18(80-100%): Severe anaemic status

Part III:

It consists of bio-physiological approach to estimate the haemoglobin status among adolescent girls using cynmet haemoglobin method.

According to NFHS (National Family Health Services)-3 2005-2006 the haemoglobin status in adolescent girls is 12gm/dl.

Interpretation:

As per the WHO classification the subjects were grouped as follows:

Mild anaemia: (10-12gm/dl)

Moderate anaemia: (7-10gm/dl)

Severe anaemia: (<7gm/dl)

TESTING OF THE TOOL

Validity

Validity of the tool was given to seven experts from the field of paediatrics, medicine, nursing, and nutrition for their opinion and suggestion. Based on their valuable suggestions, reframing of tool was done and also validity was established.

Reliability

The reliability of measuring tool is a major criterion in assessing the accuracy. The reliability was established for bio-physiological approach and the checklist to assess anaemic status by inter-rater reliability and the R value is 0.99 and 0.92.

INTERVENTION

The intervention was given for 6 weeks. During this period samples will be selected and divided into two groups as the experimental and the control group. Pre-test will be conducted by collecting the demographic data, assessing the physical signs and symptoms of anemic status among adolescent girls, check for hemoglobin using bio-physiological approach. Then dewormed the selected samples by Tab. Albendazole 400mg. Then intervention was applied to the experimental group. Each sample was about 2gm (1/2 teaspoon) amla fruit powder and raw dates of 30gm in the morning and 2gm (1/2 teaspoon) of amla fruit powder and 20gm of raw dates in the evening for 4 weeks. The control group was maintained by regular dietary practices. After that the post-test was done to both the control and the experimental group.

PILOT STUDY

In order to test the relevance and practicability of the study. A Pilot study was conducted among 6 subjects. Data was analysed to find out the suitability of statistics.

Findings revealed that the study was feasible. The pilot study participants were excluded from the main study.

DATA COLLECTION PROCEDURE

The period of data collection was 6 weeks. Before conducting the study, the researcher obtained the written permission from District Educational office for conducting the study. About 100 students in the age group of 13-16 years were selected from the boarding home by purposive sampling from 8^{th} ,9^{th} , 10^{th} and 11^{th} standard and checked haemoglobin for all the 100 students to find out the anaemia. Then, out of 100 samples, 74 students were detected with haemoglobin below 12mg/ dl. In that 36 samples from Boarding home A and 38 samples from Boarding home B were selected by simple random sampling using lottery method.

During this period samples were selected randomly and divided into two groups as the experimental group in the boarding home A and the control group in the boarding home B. Pre-test was conducted by collecting the demographic data, assessed the physical signs and symptoms of anaemic status among adolescent girls, by the bio physiological approach. The selected samples were dewormed with the Tab. Albendazole 400mg.

Then intervention was applied to the experimental group. Each sample was given about 2gm amla fruit powder and dates of 30gm in the morning and 2gm of amla fruit powder and 20gm of dates in the evening for 6 weeks. The control group was maintained by regular dietary practices.

After 4 weeks of continuous administration, the post-test was done to both the control and the experimental groups and monitored the physical signs and symptoms

of anaemic status by checklist, checked haemoglobin by bio-physiological approach. No problem was encountered during the data collection period.

Schematic representation of the data collection procedure

<table>
<tr><td>Pre-test</td><td>Week I</td><td>Pre-test for the experimental and the control group Then dewormed the selected sample by administer Tab.Albendazole 400mg.</td></tr>
<tr><td rowspan="4"></td><td>Week II</td><td rowspan="4">Administration of amla with dates in morning and evening 2gm (1/2 teaspoon)of amla Fruit powder and 30gm of dates was given in the morning and 2gm amla Fruit powder and 20gm of dates was given in the evening</td></tr>
<tr><td>Week III</td></tr>
<tr><td>Week IV</td></tr>
<tr><td>Week V</td></tr>
<tr><td>Post-test</td><td>Week VI</td><td>Post-test for the experimental and the control group</td></tr>
</table>

PLAN FOR THE DATA ANALYSIS

Data analysis was done in accordance with the objectives of the study. Both descriptive and inferential statistics were used, to analyse the data.

PROTECTION OF HUMAN RIGHTS

- ✓ The proposed study was conducted after the approval by dissertation committee of the college.
- ✓ Permission was obtained from the District Educational Officer, Melur, Madurai.
- ✓ Oral consent from each study subject was obtained before starting data collection.

This chapter dealt with a brief description of research approach, research design, study setting, population, sample and sampling technique, development of tool and testing of tool.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the description of sample analysis and interpretation of the data collected to evaluate the achievement of the objectives of the study. The data collected is tabulated and described as follows.

SECTION I:

Demographic profile of adolescent girls:

- Frequency and percentage distribution of the adolescent girls based on demographic profile.
- Frequency and percentage distribution of the adolescent girls based on parent's demographic profile.

SECTION II:

- Frequency and percentage distribution of the adolescent girls on the basis of anaemia signs and symptoms.

SECTION III:

- Frequency and percentage distribution of the adolescent girls based on haemoglobin score.

SECTION IV:

- Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the experimental group.
- Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the control group.

SECTION V:

- Comparison of the mean pre-test and post-test anaemic status based on haemoglobin score of the experimental group.
- Comparison of the mean pre-test and post-test anaemic status based on the haemoglobin score of the control group.

SECTION VI:

- Comparison of the mean pre-test and post-test fatigue score of the experimental group.
- Comparison of the mean pre-test and post-test lack of concentration score of the experimental group.
- Comparison of the mean pre-test and post-test pica score of the experimental group

SECTION VII:

- Comparison of the mean post-test fatigue score of the experimental and control group.
- Comparison of the mean post-test lack of concentration score of the experimental and control group.
- Comparison of the mean post-test pica score of the experimental and the control group.

SECTION VIII:

- Comparison of the mean post-test anaemic status based on signs and symptoms scores of the experimental and the control group.

SECTION IX:

- Comparison of the mean post-test anaemic status based on haemoglobin score of the experimental and the control group.

SECTION X:

- Association of post-test anaemic status based on haemoglobin score of the experimental group and selected demographic variables such as the age, income of the family, literacy status of the mother, literacy status of the father and the type of diet.

SECTION I

Demographic profile of adolescent girls:

Table 1:

Frequency and percentage distribution of the adolescent girls based on demographic profile.

N=60

Demographic Characteristics	Experimental Group n=30		Control Group n=30		Total N=60	
	f	%	f	%	f	%
Age						
a) 13-14 years	16	53.4	15	50	31	51.7
b) 15-16 years	14	46.6	15	50	29	48.3
Education						
a) 8th standard	10	33.4	9	30	19	31.6
b) 9th standard	6	20	6	20	12	20
c) 10th standard	6	20	8	26.6	14	23.4
d) 11th standard	8	26.6	7	23.4	15	25
Type of diet						
a) Vegetarian	5	16.6	5	16.6	10	16.6
b) Non-vegetarian	25	83.4	25	83.4	50	83.4

Table 1 represents the distribution of the adolescent girls according to demographic profile of the experimental and the control group. It is evident that in the experimental group out of 30 adolescent girls 16 (53.4%) were 13-14 years old, 14 (46.6%) were 15-16 years old. With regard to the educational status of the adolescent girls out of 30, 10(33.4%) were in 8^{th} standard, 6(20%) were in 9^{th} standard, 6(20%) were in 10^{th} standard and 8(26.6%) were in 11^{th} standard. Concerning the type of diet 5 (16.6%) adolescent girls were vegetarian and 25 (83.4%) were non-vegetarian.

In the control group out of 30 adolescent girls, 15 (50%) were 13-14 years old, 15 (50 %) were 15-16 years old. With regard to the educational status of the adolescent girls out of 30, 9(30%) were in 8^{th} standard, 6(20%) were in 9^{th} standard, 8(26.6%) were in 10^{th} standard and 7(23.4%) were in 11^{th} standard. Concerning the type of diet 5 (16.6%) adolescent girls were vegetarians and 25 (83.4%) were non-vegetarians.

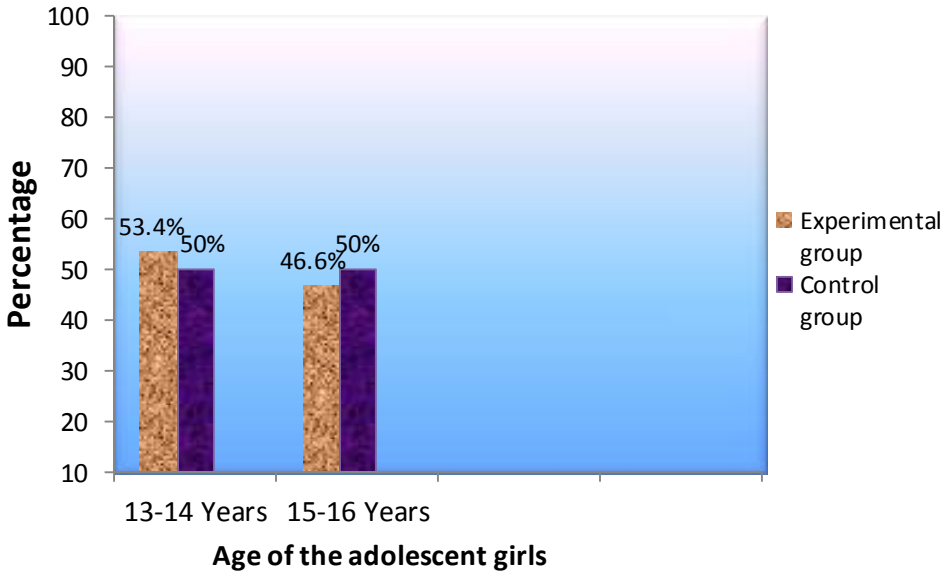


Figure 2: Distribution of the adolescent girls according to age

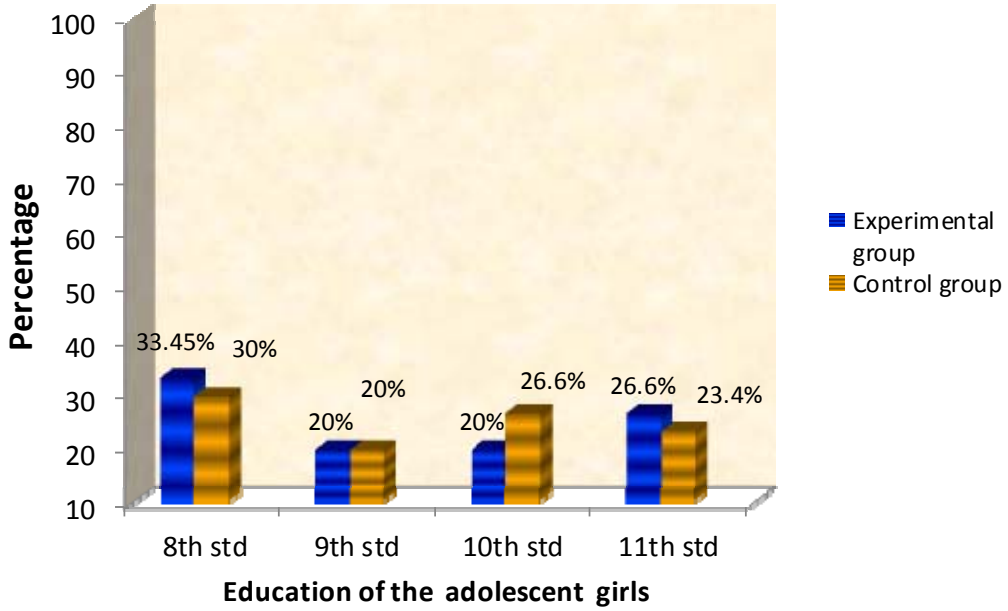


Figure 3: Distribution of the adolescent girls according to education

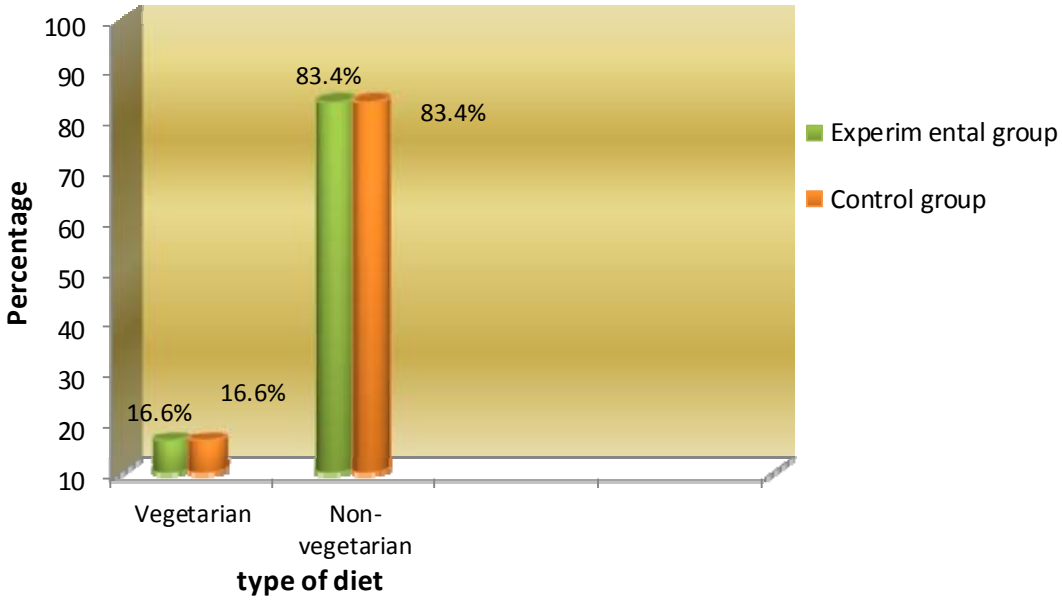


Figure 4: Distribution of adolescent girls according to type of diet

Table 2:

Frequency and percentage distribution of the adolescent girls based on parent's demographic profile. N=60

Demographic Characteristics	Experimental Group n=30		Control Group n=30		Total N=60	
	f	%	f	%	f	%
Income /month						
a) Rs <2500	18	60	10	33.3	28	46.6
b) Rs 2501-5000	10	33.3	17	56.7	27	45
c) Rs>5001	2	6.7	3	10	5	8.4
Literacy status of the mother						
a) Illiterate	13	43.4	6	20	19	31.7
b) Primary school	17	56.6	12	40	29	48.3
c) Higher secondary	0	0	12	40	12	20
d) College	0	0	0	0	0	0
Literacy status of the father						
a) Illiterate	13	43.4	7	23.4	20	33.3
b) Primary school	14	46.6	10	33.3	24	40
c) Higher secondary	3	10	10	33.3	13	21.7
d) College	0	0	3	10	3	5

Table 2 represents the distribution of the adolescent girls based on parent's demographic profile of the experimental and the control group. It is evident that in the experimental group out of 30 adolescent girls, with regard to the family income, 18 (60%) families had Rs <2500, 10 (33.3%) between Rs 2501-5000, and 2 (6.7%) Rs >5001. With regard to the literacy status of the mother 13 (43.4%) adolescent girl's mother were illiterate and 17 (56.6%) primary education. With regard to the literacy status of the father 13 (43.4%) adolescent girl's father were illiterate, 14 (46.6%) primary education and 3 (10%) higher secondary education.

In the control group out of 30 adolescent girls, with regard to the family income of 10 (33.3%) families had Rs <2500, 17 (56.7%) between Rs 2501-5000, and 3 (10%) Rs >5001. With regard to the literacy status of the mother 6 (20%) adolescent girl's mothers were illiterate, 12 (40%) had primary education and 12 (40%) higher secondary education. With regard to the literacy status of the father 7 (23.4%) adolescent's father were illiterate, 10 (33.3%) primary education, 10 (33.3%) higher secondary education and 3(5%) with college education.

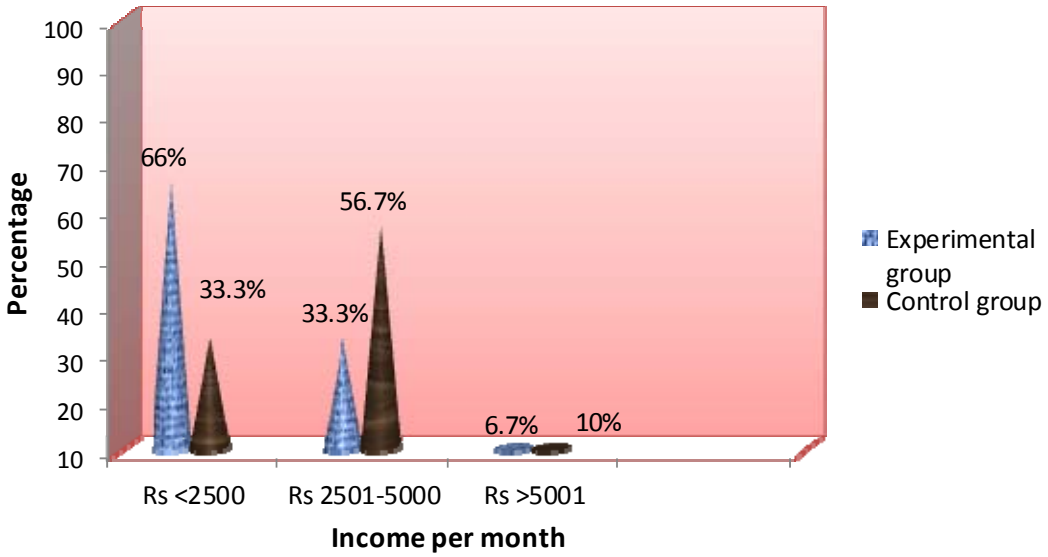


Figure 5: Distribution of the adolescent girls according to income per month

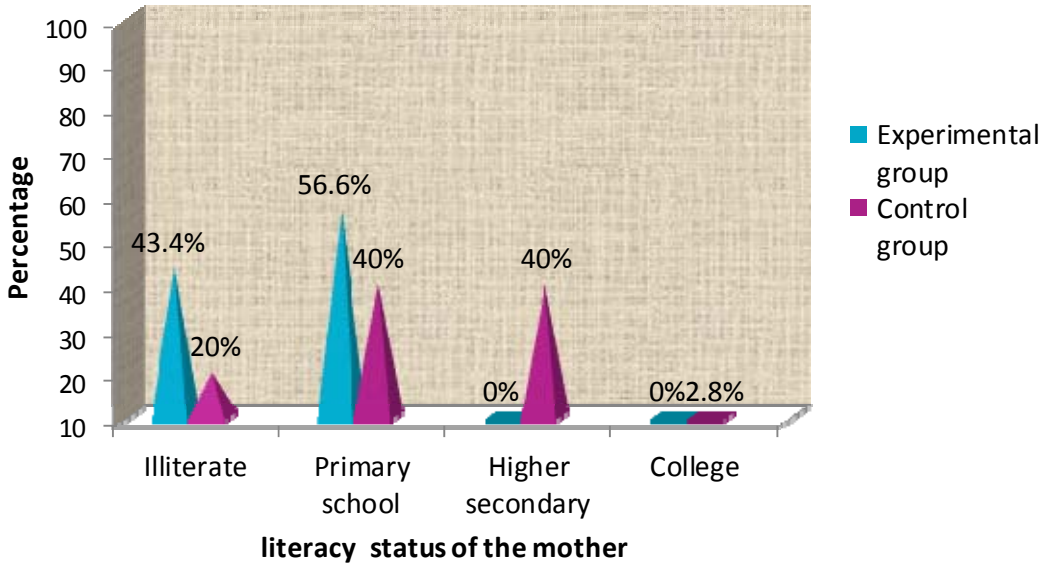


Figure 6: Distribution of the adolescent girls according to literacy status of the mother

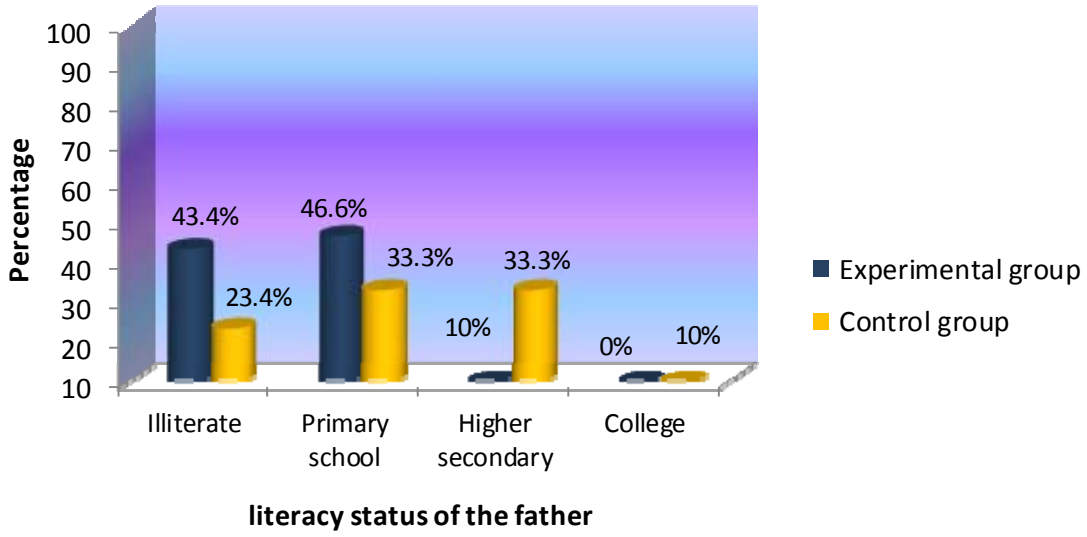


Figure 7: Distribution of the adolescent girls according to literacy status of the father

SECTION II

Table 3:

Frequency and percentage distribution of the adolescent girls on the basis of anaemia signs and symptoms.

N=60

Anaemia Signs and Symptoms	Experimental Group n=30				Control Group n=30			
	Pre-test		Post-test		Pre-test		Post-test	
	f	%	f	%	f	%	f	%
Symptoms								
a) Fatigue	24	80	5	16.6	19	63.3	23	76.6
b) Lack of concentration	23	76.6	12	40	23	76.6	20	66.6
c) Shortness of breath	11	36.6	7	23.3	15	50	16	53.4
d) Habit of pica eating	17	56.6	7	23.3	19	63.3	21	70
e) Getting irritated often	30	100	17	56.6	16	53.4	16	53.4
f) Palpitation	17	56.6	9	30	16	53.4	17	56.6
g) Anorexia	18	60	14	46.6	20	66.6	18	60
Signs								
a) Palpebral conjunctiva	22	73.3	12	40	19	63.3	16	53.4
b) Pallor of tongue	14	46.6	3	10	15	50	16	53.4
c) Pallor of nails	18	60	7	23.3	14	46.6	17	56.6
d) Pallor of palm and soles	9	30	3	10	16	53.4	11	36.6
e) Growth retardation	24	80	24	80	19	63.3	19	63.3

This table shows that in the experimental group frequency of anaemia symptoms, during the pre-test reveals that out of 30 adolescent girls 24(80%) had fatigue,23(76.6%) lack of concentration,11(36.6%) shortness of breath,17(56.6%) pica eating, 30(100%) getting irritated often,17(56.6%) palpitation and18(60%) anorexia, whereas in the post-test the only 5(16.6%) had fatigue, 12(40%) lack of

concentration, 7(23.3%) shortness of breath,7(23.3%) pica eating,17(56.6%) getting irritated often, 9(30%) palpitation and 14(46.6%) anorexia.

In the experimental group frequency of anaemia signs, during the pre-test reveals that out of 30 adolescent girls 22(73.3%) had palpebral conjunctiva, 14(46.6%) pallor of tongue, 18(60%) pallor of nails,9(30%) pallor of palms and soles and 24(80%) growth retardation, whereas in the post-test 12(40%) had palpebral conjunctiva, 3(10%) pallor of tongue,7(23.3%) pallor of nails,3(10%) pallor of palms and soles and 24(80%) growth retardation.

In the control group frequency of anaemia symptoms, during the pre-test reveals that out of 30 adolescent girls19(63.3%) had fatigue,23(76.6%) lack of concentration,15(50%) shortness of breath,19(63.3%) pica eating, 16(53.4%) getting irritated often, 16(53.4%) palpitation and 20(66.6%) anorexia, whereas in the post-test the 23(76.6%) had fatigue, 20(66.6%) lack of concentration, 16(53.4%) shortness of breath,21(70%) pica eating,16(53.4%) getting irritated often,17(56.6%) palpitation and18(60%) anorexia.

In the control group, frequency of anaemia signs, during the pre-test reveals that out of 30 adolescent girls 19(63.3%) had palpebral conjunctiva, 15(50%) pallor of tongue, 14(46.6%) pallor of nails,16(53.4%) had pallor of palms and soles and 19(63.3%) growth retardation, whereas in the post-test 16(53.3%) had palpebral conjunctiva, 16(53.3%) pallor of tongue,17(56.6%) pallor of nails,11(36.6%) pallor of palms and soles and19(63.3%) growth retardation.

SECTION III

Table 4:

Frequency and percentage distribution of the adolescent girls based on haemoglobin score. N=60

Haemoglobin status	Experimental Group n=30				Control Group n=30			
	Pre-test		Post-test		Pre-test		Post-test	
	f	%	f	%	f	%	f	%
Normal (>12 gm / dl)	0	0	1	3.4	0	0	0	0
Mild (10-12 gm / dl)	17	56.6	24	80	19	63.3	12	40
Moderate (7-10 gm / dl)	13	43.4	5	16.6	10	33.3	17	56.6
Severe (<7 gm / dl)	0	0	0	0	1	3.4	1	3.4

This table shows that in the experimental group pre-test using haemoglobin estimation by cynmet haemoglobin method reveals that no one had normal haemoglobin level out of 30 adolescent girls. In the post-test one girl 1 (3.4%) had normal haemoglobin level. In the pre-test 17 (56.6%) had mild anaemia and in the post-test it was increased upto 24 (80%) in the mild anaemia. In the pre-test out of 30 adolescent girls 13 (43.4%) had moderate anaemia and this number decreased to 5 (16.6%) during the post-test. Both in the pre-test and the post-test no one had severe anaemia.

In the control group out of 30 adolescent girls 19 (63.3%) had mild anaemia and 10 (33.3%) moderate anaemia in the pre-test. In the post-test the number of adolescent girls in the mild anaemic group has decreased upto 12 (40%) and the number of adolescent girls in the moderate anaemic group increased upto 17 (56.6%). Both pre-test and post-test had 1 (3.4%) had severe anaemia.

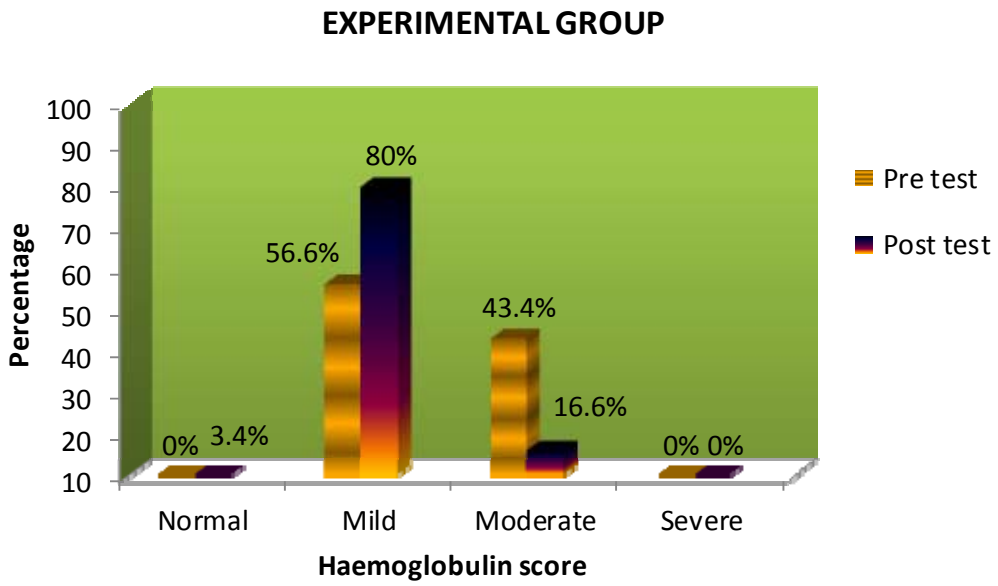


Figure 8: Distribution of adolescent girls based on haemoglobin score in the experimental group.

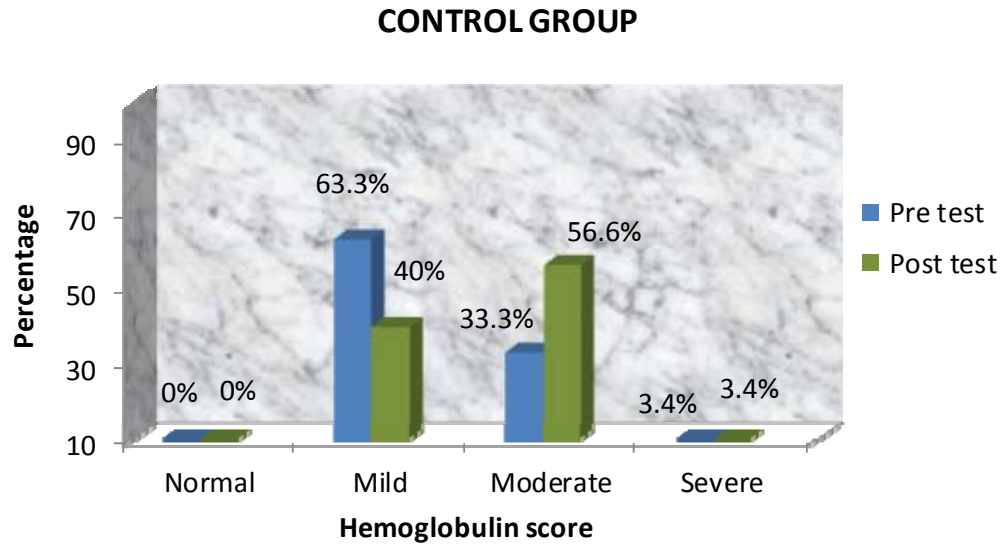


Figure 9: Distribution of adolescent girls based on haemoglobin score in the control group.

SECTION IV

Table 5:

Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the experimental group. N=30

Variables	Signs and symptoms score	Mean	SD	''t' value	''p' value
Experimental Group	Pre-test	10.76	2.368	10.8*	0.05
	Post-test	5.7			

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean anaemic status based on signs and symptoms scores in the adolescent girls before and after administration of amla with dates, the null hypothesis was stated as follows. There will be no significant difference between the mean anaemic status based on signs and symptoms scores in the adolescent girls before and after administration of amla with dates.

Table 5 shows that the mean anaemic status based on signs and symptoms scores after administration of amla with dates (5.7) was lower than the mean anaemic status based on signs and symptoms scores before administration of amla with dates (10.76) in the adolescent girls. The obtained 't' value is 10.8 at df 29 was significant at 0.05 level. This indicates that the difference between the means (5.06) was a true difference and has not occurred by chance. The difference between mean (5.06) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings fail to support the null hypothesis, hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 6:

Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the control group. N=30

Variables	Signs and symptoms score	Mean	SD	't' value	'p' value
Control Group	Pre-test	10.5	3.51	0.4#	0.05
	Post-test	9.3			

Not Significant at P ≤ 0.05 level

To find out if there is any difference between the mean pre-test and post-test anaemic status based on signs and symptoms scores of the control group in the adolescent girls, the null hypothesis was stated as follows.

There will be no significant difference between the mean pre-test and post-test anaemic status based on signs and symptoms scores of the control group in the adolescent girls.

Table 6 shows that the mean pre-test anaemic status based on signs and symptoms scores (10.5) was higher than the mean post-test anaemic status based on signs and symptoms scores (9.3) of the control group in the adolescent girls. The obtained't' value is 0.4 at df 29 was not significant at 0.05 level.

SECTION V

Table 7:

Comparison of the mean pre-test and post-test anaemic status based on haemoglobin score of the experimental group. **N=30**

Variables	Haemoglobin	Mean	SD	't' value	'p' value
Experimental Group	Pre-test	9.94	0.46	11.03*	0.05
	Post-test	10.87			

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean anaemic status based on haemoglobin score of adolescent girls before and after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean anaemic status based on haemoglobin score of adolescent girls before and after administration of amla with dates.

Table 7 shows that the mean anaemic status based on haemoglobin score after administration of amla with dates (10.87) was higher than the mean anaemic status based on haemoglobin score before administration of amla with dates (9.94) in the adolescent girls. The obtained't' value is 11.03 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.93) was a true difference and has not occurred by chance. The difference between mean (0.93) pre-test and post-test may be due to the effect of amla with dates.

The above findings fail to support the null hypothesis, hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 8:

Comparison of the mean pre-test and post-test anaemic status based on haemoglobin score of the control group N=30

Variables	Haemoglobin	Mean	SD	't' value	'p' value
Control Group	Pre-test	9.20	1.1	1.9#	0.05
	Post-test	9.518			

Not Significant at P ≤ 0.05 level

To find out if there is any difference between the mean pre-test and post-test anaemic status based on haemoglobin score of the control group in the adolescent girls the null hypothesis was stated as follows.

There will be no significant difference between the mean pre-test and post-test anaemic status based on haemoglobin score of the control group in the adolescent girls.

Table 8 shows that the mean pre-test anaemic status based on haemoglobin score (9.20) was higher than the mean post-test anaemic status based on haemoglobin score (9.51) of the control group in the adolescent girls. The obtained't' value is 1.9 at df 29 was not significant at 0.05 level.

SECTION VI

Table 9:

Comparison of the mean pre-test and post-test fatigue score of the experimental group. N=30

Variables	Fatigue score	Mean	SD	't' value	'p' value
Experimental Group	Pre-test	0.80	0.96	7.2*	0.05
	Post-test	0.16			

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean fatigue score in the adolescent girls before and after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean fatigue score in the adolescent girls before and after administration of amla with dates.

Table 9 shows that the mean fatigue score after administration of amla with dates (0.16) was lower than the mean fatigue score before administration of amla with dates (0.80) in the adolescent girls. The obtained't' value is 7.2 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.64) was a true difference and has not occurred by chance. The difference between mean (0.64) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings fail to support the null hypothesis, hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 10:

Comparison of the mean pre-test and post-test lack of concentration score of the experimental group. N=30

Variables	Lack of concentration score	Mean	SD	't' value	'p' value
Experimental Group	Pre-test	0.76	0.48	4.2*	0.05
	Post-test	0.4			

***Significant at P $\leq$ 0.05 level**

To find out if there is any difference between the mean Lack of concentration score in the adolescent girls before and after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean Lack of concentration score in the adolescent girls before and after administration of amla with dates.

Table 10 shows that the mean Lack of concentration score after administration of amla with dates (0.4) was lower than the mean Lack of concentration score before administration of amla with dates (0.76) in the adolescent girls. The obtained 't' value is 4.2 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.36) was a true difference and has not occurred by chance.. The difference between mean (0.36) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings fail to support the null hypothesis, hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 11:

Comparison of the mean pre-test and post-test pica score of the experimental group. N=30

Variables	Pica score	Mean	SD	't' value	'p' value
Experimental Group	Pre-test	0.56	0.469	3.83*	0.05
	Post-test	0.23			

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean pica score in the adolescent girls before and after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean pica score in the adolescent girls before and after administration of amla with dates.

Table 11 shows that the mean pica score after administration of amla with dates (0.23) was lower than the mean pica score before administration of amla with dates (0.56) in the adolescent girls. The obtained't' value is 3.83 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.33) was a true difference and has not occurred by chance. The difference between means (0.33) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings fail to support the null hypothesis, hence the researcher rejects the null hypothesis and accepts the research hypothesis.

SECTION VII

Table 12:

Comparison of the mean post-test fatigue score of the experimental and the control group. N=60

Variables	N	Mean	SD	't' value	'p' value
Experimental Group	30	0.16	0.96	4.69*	0.05
Control Group	30	0.76	0.67		

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean post-test fatigue score of the experimental and the control group after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean post-test fatigue score of the experimental and the control group.

Table 12 shows that the mean post-test fatigue score of the experimental group (0.16) after administration of amla with dates was lesser than the mean post-test fatigue score of the control group (0.76). The obtained 't' value is 4.69 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.6) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of administration of amla with dates.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 13:

Comparison of the mean post-test lack of concentration score of the experimental and the control group. N=60

Variables	N	Mean	SD	't' value	'p' value
Experimental Group	30	0.4	0.48	2.6*	0.05
Control Group	30	0.6	0.3		

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean post-test lack of concentration score of the experimental and the control group after administration of amla with dates, the null hypothesis was stated as follows

There will be no significant difference between the mean post-test lack of concentration score of the experimental and the control group.

Table 13 shows that the mean post-test lack of concentration score of the experimental group (0.4) after administration of amla with dates was lesser than the mean post-test lack of concentration score of the control group (0.6). The obtained't' value is 2.6 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.2) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of administration of amla with dates.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis and accepts the research hypothesis.

Table 14:

Comparison of the mean post-test pica score of the experimental and the control group. N=60

Variables	N	Mean	SD	't' value	'p' value
Experimental Group	30	0.23	0.46	2.55*	0.05
Control Group	30	0.7	0.3		

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean post-test pica score of the experimental and the control group after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean post-test pica score of the experimental and the control group.

Table 14 shows that the mean post-test pica score of the experimental group (0.23) after administration of amla with dates was lesser than the mean post-test pica score of the control group(0.7). The obtained't' value is 2.55 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (0.47) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect administration of amla with dates.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis and accepts the research hypothesis.

SECTION VIII

Table 15:

Comparison of the mean post-test anaemic status based on signs and symptoms scores of the experimental and the control group. N=60

Variables`	N	Mean	SD	't' value	'p' value
Experimental Group	30	5.7	2.36	5.955*	0.05
Control Group	30	9.3	3.09		

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean post-test anaemic statuses based on signs and symptoms scores of the experimental and the control group after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean post-test anaemic status based on signs and symptoms scores of the experimental and the control group.

Table 15 shows that the mean post-test anaemic status based on signs and symptoms scores of the experimental group (5.7) after administration of amla with dates was lesser than the mean post-test anaemic status based on signs and symptoms scores of the control group (9.3). The obtained't' value is 5.955 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (3.6) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of amla with dates.

The above findings support the research hypothesis. Hence the researcher rejects the null hypothesis and accepts the research hypothesis.

SECTION IX

Table 16:

Comparison of the mean post-test anaemic status based on haemoglobin score of the experimental and the control group N=60

Variables	N	Mean	SD	't' value	'p' value
Experimental Group	30	10.87	0.46	6.72*	0.05
Control Group	30	9.51	1.22		

***Significant at P ≤ 0.05 level**

To find out if there is any difference between the mean post-test anaemic statuses based on haemoglobin score of the experimental and the control group after administration of amla with dates, the null hypothesis was stated as follows.

There will be no significant difference between the mean post-test anaemic status based on haemoglobin score of the experimental and the control group.

Table 16 shows that the mean post-test anaemic status based on haemoglobin score of the experimental group (10.87) after administration of amla with dates was higher than the mean post-test anaemic status based on haemoglobin score of the control group (9.51). The obtained 't' value is 6.72 at df 29 was significant at 0.05 level.

This indicates that the difference between the means (1.36) was a true difference and has not occurred by chance. The difference between means due to the effect of administration of amla with dates.

The above findings support the research hypothesis. Hence the researcher rejected the null hypothesis and accepts the research hypothesis.

SECTION X

Table 17:

Association of post-test anaemic status based on haemoglobin score of the experimental group and selected demographic variables. N=60

Variables	Haemoglobin status Below Mean	Haemoglobin status Above Mean	N	λ^2	df	'p' value
Age (in years)						
a)13-14 years	3	13	16	6.72*	1	0.05
b)15-16 years	3	11	14			
Income /month						
a)Rs<2500	3	14	17			
b)Rs 2501-5000	2	9	1	6.37*	2	0.05
c)Rs>5001	1	1	2			
Literacy status of the mother						
a)Illiterate	3	10	13			
b)Primary chool	3	14	17	0.135#	1	0.05
c)Higher secondary	0	0	0			
d)College	0	0	0			
Literacy status of the father						
a)Illiterate	3	10	13			
b)Primary school	2	12	14	3.731#	4	0.05
c)Higher-secondary	1	2	3			
d)College	0	0	0			
Type of diet						
a)Vegetarian	2	3	5	1.5#	2	0.05
b)Non-vegetarian	4	21	25			

*** Significant at P $\leq$ 0.05 level, # Not significant at P $\leq$ 0.05 level**

To find out if there is any association between anaemic status based on haemoglobin score and age, income of the family, literacy status of the mother, literacy status of the father and the type of diet.

In order to find out the association between the anaemic status based on haemoglobin score and selected variables λ^2 was computed. While testing the association between the anaemic status based on haemoglobin score and the age of the girls, the obtained λ^2 value is 6.72 at df (1) was significant. While testing the association between the anaemic statuses based on haemoglobin score and the income of the family, the obtained λ^2 value is 6.37 at df (2) was significant. While testing the association between the anaemic statuses based on haemoglobin score and the literacy status of the mother, the obtained λ^2 value is 0.135 at df (1) was not significant. While testing the association between the anaemic statuses based on haemoglobin score and the literacy status of the father, the obtained λ^2 value is 3.731 at df (4) was not significant. While testing the association between the anaemic statuses based on haemoglobin score and the type of diet, the obtained λ^2 value 1.5 at df (2) was not significant.

This proves that as stated in research hypothesis, there was a significant association between the anaemic status based on haemoglobin score and selected demographic variables such as age, income of the family and there was no association between the anaemic statuses based on haemoglobin score and selected demographic variables such as literacy status of the mother, literacy status of the father and the type of diet.

Thus the researcher concludes that age of the girls and income of the family has effect on anaemic status after administration of amla with dates and literacy status of the mother, literacy status of the father, type of diet has no effect on anaemic status after administration of amla with dates.

CHAPTER V

DISCUSSION

The study evaluated the effectiveness of intake of dates with amla on anaemic status among adolescent girls with anaemia. The study findings are discussed in this chapter with reference to the objectives, framework and hypotheses stated in chapter I.

Distribution of the adolescent girls according to demographic profile:

The present study highlights that the, table 1 showed as

- Most of the adolescent girls 31 (51.7%) were 13-14 years old and 29 (48.3%) 15-16 years old.
- Adolescent girls were proportionately distributed in all standards.
- Most of the adolescent girls were 50 (83.4%) non-vegetarian and 10 (16.6%) vegetarian.

Gopalan (1992) conducted a study on prevalence of anaemia and revealed that great majority of (2/3rd) of young adolescent girls (6-14 years) were anaemic. The present study also showed majority of the adolescent girls 31(51.7%) were in the age group of 13-14 years.

Distribution of the adolescent girls based on parent's demographic profile:

The present study highlights that the, table 2 showed as

- Regarding the Total family income, out of 30 of 28 (46.6%) families was Rs < 2500, 27 (45%) between Rs 2501-5000, and 5 (8.4%) Rs >5001.

- Regarding the literacy status of the mother 19 (31.7%) adolescent girl's mother were illiterate, 29 (48.3%) primary education and 12(20%) higher secondary education.
- Regarding the literacy status of the father 20 (33.3%) adolescent girl's father were illiterate, 24 (40%) primary education, 13 (21.7%) higher secondary education and 3(5%) college education.

Distribution of the adolescent girls on the basis of anaemia signs and symptoms:

Table 3 shows that in the experimental group frequency of anaemia symptoms, during the pre-test reveals that out of 30 adolescent girls 24(80%) had fatigue, 23(76.6%) lack of concentration, 11(36.6%) shortness of breath, 17(56.6%) pica eating, 30(100%) getting irritated often, 17(56.6%) palpitation and 18(60%) anorexia, whereas in the post-test the only 5(16.6%) had fatigue, 12(40%) lack of concentration, 7(23.3%) shortness of breath, 7(23.3%) pica eating, 17(56.6%) getting irritated often,9(30%) palpitation and 14(46.6%) anorexia.

In the experimental group frequency of anaemia signs, during the pre-test reveals that out of 30 adolescent girls 22(73.3%) had palpebral conjunctiva, 14(46.6%) pallor of tongue, 18(60%) pallor of nails, 9(30%) pallor of palms and soles and 24(80%) growth retardation, whereas in the post-test 12(40%) had palpebral conjunctiva, 3(10%) pallor of tongue, 7(23.3%) pallor of nails,3(10%) pallor of palms and soles and 24(80%) growth retardation.

In the control group frequency of anaemia symptoms, during the pre-test reveals that out of 30 adolescent girls 19(63.3%) had fatigue, 23(76.6%) lack of concentration, 15(50%) shortness of breath, 19(63.3%) pica eating, 16(53.4%)

getting irritated often, 16(53.4%) palpitation and 20(66.6%) anorexia, whereas in the post-test the 23(76.6%) had fatigue, 20(66.6%) lack of concentration, 16(53.4%) shortness of breath, 21(70%) pica eating, 16(53.4%) getting irritated often, 17(56.6%) palpitation and 18(60%) anorexia.

In the control group frequency of anaemia signs, during the pre-test reveals that out of 30 adolescent girls 19(63.3%) had palpebral conjunctiva, 15(50%) pallor of tongue, 14(46.6%) pallor of nails, 16(53.4%) had pallor of palms and soles and 19(63.3%) growth retardation, whereas in the post-test 16(53.3%) had palpebral conjunctiva, 16(53.3%) pallor of tongue, 17(56.6%) pallor of nails, 11(36.6%) pallor of palms and soles and 19(63.3%) growth retardation.

The researcher finds that there were more variations of results between the percentage of anaemia signs and symptoms between the pre-test and post-test of the control group.

These findings was supported by the following statement of Van Winkle (2009) He stated, "Adolescents often have chaotic eating patterns that do not follow dietary recommendations. Fewer than 2% of adolescents eat enough of all the food groups, and almost 20% of females and 7% of males do not eat enough of even one of the food groups. Frequent dieting or restricted eating, skipping meals, vegetarian eating styles and others listed at left are all risk factors for anemia in adolescents. In spite of the increased iron needs, many adolescents, especially females, do not get enough iron from their diets. About 75% teenaged girls, do not meet their dietary requirements for iron, compared to only 17% of teenaged boys."

Distribution of the adolescent girls based on haemoglobin score

Totally 60 samples were selected and divided into experimental and control group. The groups were dewormed and haemoglobin estimation was done.

Table 4 shows that in the experimental group, the pre-test using haemoglobin estimation by cynmet haemoglobin method reveals that no one had normal haemoglobin level out of 30 adolescent girls. In the post-test one girl (3.4%) had normal haemoglobin level. In the pre-test 17 (56.6%) had mild anaemia and in the post-test it was increased upto 24 (80%) in the mild anaemia. In the pre-test out of 30 adolescent girls 13 (43.4%) had moderate anaemia and this number decreased to 5 (16.6%) during the post-test. Both in the pre-test and post-test no one had severe anaemia.

In the control group out of 30 adolescent girls 19 (63.3%) had mild anaemia and 10 (33.3%) moderate anaemia in the pre-test. In the post-test the number of adolescent girls in the mild anaemia has decreased upto 12 (40%) and the number of adolescent girls in the moderate anaemic group increased upto 17 (56.6%). Both pre-test and post-test had one girl (3.4%) had severe anaemia.

This report was supported by the following study findings of Rajaratnam Abel (2009). He revealed that " Following early childhood (<2 years), during the adolescent growth spurt, the risk of iron deficiency and anaemia reappears for both boys and girls, after which it subsides for boys but remains for girls because of menstrual blood loss. Iron deficiency affects the ability of adolescents to read, write and learn also." The prevalence of anaemia is 44.8% with severe anaemia being 2.1%, moderate 6.3% and mild anaemia 36.5%."

The first objective of this study was to assess the level of anaemic status before and after the administration of amla and dates among the experimental group of adolescent girls with anaemia.

Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the experimental group.

Table 5 shows that the mean anaemic status based on signs and symptoms scores after administration of amla with dates (5.7) was lower than the mean anaemic status based on signs and symptoms scores before administration of amla with dates (10.76) in the adolescent girls. The obtained 't' value is 10.8 at df 29 was significant at 0.05 level. This indicates that the difference between the means (5.06) was a true difference and has not occurred by chance.. The difference between mean (5.06) before and after administration of amla with dates may be due to the effect of amla with dates.

The study finding was supported by the statement of Lloyd Van Winkle (2009). He stated that "An important risk factor for iron deficiency anaemia is heavier than normal menstrual bleeding, which affects about 10% of women in the United States. Adolescent females often do not get enough iron to keep up with menstrual losses. Because the body's iron supply is depleted slowly, a lot of teenagers with iron deficiency anaemia don't have symptoms that are easy to see. As anaemia gradually gets worse, though, they may start to experience some noticeable symptoms, like tiredness, weakness, pale skin, rapid heartbeat, irritability, decreased appetite or dizziness.

In this present study the researcher observed that administration of amla with dates had reduced the anaemia signs and symptoms.

Comparison of the mean pre-test and post-test anaemic status based on haemoglobin score of the experimental group.

Table 6 shows that the mean anaemic status based on haemoglobin score after administration of amla with dates (10.87) was higher than the mean anaemic status based on haemoglobin score before administration of amla with dates (9.94) in the adolescent girls. The obtained‘t’ value is 11.03 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.93) was a true difference and has not occurred by chance. The difference between mean (0.93) pre-test and post-test may be due to the effect of amla with dates.

This findings was supported by study of Cinju john (2009) who conducted a study in Bangalore, to assess whether the iron deficiency anaemia in young working women and the results showed that it can be reduced by increasing the consumption of cereal based fermented foods or gooseberry at workplace .The study employed 302 women aged 18-23 years .Out of these, a group of 80 women were given 20 ml of gooseberry juice containing 40 mg of vitamin C three times a week once in a month .The haemoglobin status of this group of women improved significantly from 11.20 g/dl to 12.70 g/dl. The study revealed that the type of workplace lunch was of greater significance than Information, Education and Communication.

Comparison of the mean pre-test and post-test fatigue score of the experimental group.

Table 7 shows that the mean fatigue score after administration of amla with dates (0.16) was lower than the mean fatigue score before administration of amla with dates (0.80) in the adolescent girls. The obtained‘t’ value is 7.2 at df 29 was significant at 0.05 level.This indicates that the difference between the means (0.64) was a true difference and has not occurred by chance. The difference between mean (0.64) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings coincide with the statement of Cathy Carlson-Rink (2010). He stated that “Teenagers with anaemia will begin to look paler by the day due to decrease in the RBC flowing in the body. Shortness of breath and fatigue, especially while performing activities like climbing stairs is a common symptom. The heart beat may become faster than usual in an attempt to pump the same amount of blood into the body cells. As a result, there may be higher pulse rate. Iron deficiency that occurs prior to iron deficiency anaemia might lessen teenager’s ability to learn, remember or concentrate”.

So the researcher felt that fatigue can be relieved by improving the anaemic status in the adolescent girls.

Comparison of the mean pre-test and post-test lack of concentration score of the experimental group.

Table 8 shows that the mean lack of concentration score after administration of amla with dates (0.4) was lower than the mean Lack of concentration score before

administration of amla with dates (0.76) in the adolescent girls. The obtained‘t’ value is 4.2 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.36) was a true difference and has not occurred by chance.. The difference between mean (0.36) before and after administration of amla with dates may be due to the effect of amla with dates.

The above findings are supported by the following statement, of Professor Cleghorn (2008) who revealed that, “In older children and adolescents, difficulty in concentrating is a common symptom of iron deficiency. Iron carries oxygen around the body and the brain has a big demand for oxygen. Sufficient iron is essential for brain function, especially attention and memory, and iron deficiency can adversely affect a child's ability to concentrate in school.”

The researcher found that the frequency of lack of concentration was widely decreased in the subjects of the experimental group after the intake of amla with dates. Additionally the adolescent girls have expressed as “As my concentration had improved I can score high marks in my exams”

Comparison of the mean pre-test and post-test pica score of the experimental group.

Table 9 shows that the mean pica score after administration of amla with dates (0.23) was lower than the mean pica score before administration of amla with dates (0.56) in the adolescent girls. The obtained‘t’ value is 3.83 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.33) was a true difference and has not occurred by chance. The difference between means (0.33)

before and after administration of amla with dates may be due to the effect of amla with dates.

The second objective of this study was to assess the pre-test and post-test level of anaemic status among the control group of adolescent girls with anaemia.

Comparison of the mean pre-test and post-test anaemic status based on signs and symptoms scores of the control group.

Table 10 shows that the mean pre-test anaemic status based on signs and symptoms scores (10.5) was higher than the mean post-test anaemic status based on signs and symptoms scores (9.3) of the control group in the adolescent girls. The obtained‘t’ value is 0.4 at df 29 was not significant at 0.05 level.

In the present study, no intervention was given to the control group. So there was no major variation seen between the pre-test and the post-test.

Comparison of the mean pre-test and post-test anaemic status based on haemoglobin score of the control group.

Table 11 shows that the mean pre-test anaemic status based on haemoglobin score (9.20) was higher than the mean post-test anaemic status based on haemoglobin score (9.51) of the control group in the adolescent girls. The obtained‘t’ value is 1.9 at df 29 was not significant at 0.05 level.

In the present study, no intervention was given to the control group. So there was no major variation seen between the pre-test and the post-test.

The third objective of this study was to evaluate the effectiveness of intake of dates with amla on the anaemic status among adolescent girls with anaemia.

Comparison of the mean post-test fatigue score of the experimental and control group.

Table 12 shows that the mean post-test fatigue score of the experimental group (0.16) after administration of amla with dates was less than the mean post-test fatigue score of the control group (0.76). The obtained't' value is 4.69 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.6) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of administration of amla with dates.

The above findings are supported by the statement of Cathy Carlson-Rink, spokesperson for dietary supplement manufacturer Flora, Inc. (2001). According to his statement "Fatigue is the most common symptom of iron deficiency -- a deficiency that affects 25% of all women in North America. By discovering and then correcting that deficiency with diet changes and proper iron supplementation, women can gradually restore iron levels and bring about a resurgence of energy"

Comparison of the mean post-test lack of concentration score of the experimental and control group.

Table 13 shows that the mean post-test lack of concentration score of the experimental group (0.4) after administration of amla with dates was less than the mean post-test lack of concentration score of the control group (0.6). The obtained't' value is 2.6 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.2) was a true difference and has not occurred by chance. The

difference between the two means could be due to the effect of administration of amla with dates.

This report was supported by the study findings of Verdon et al., (2003). The study was done in Nagpur among 50 samples, "Adolescent females have been shown to benefit from iron supplementation. Intake of iron improved lassitude, ability to concentrate in school, and mood.

Comparison of the mean post-test pica score of the experimental and control group.

Table 14 shows that the mean post-test pica score of the experimental group(0.23) after administration of amla with dates was lesser than the mean post-test pica score of the control group(0.7). The obtained't' value is 2.55 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.47) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of administration of amla with dates.

The above findings are supported by the finding of Kettaneh et al.,(2005). He conducted a study to investigate the association between pica or food craving and iron-deficiency anaemia, taking into account patients' geographic origin. He reported that the prevalence of pica was significantly lower in Europeans than in non-Europeans (6% [1/17] vs. 55% [34/62], *P*0.0002). Finally he concluded that, pica is a common behaviour related to iron deficiency, but it is also determined by cultural or ethnic factors.

In the present study, the habit of pica eating is decreased due to the effect of intake of amla with dates.

Comparison of the mean post-test anaemic status based on signs and symptoms scores of the experimental and control group.

Table 15 shows that the mean post-test anaemic status based on signs and symptoms scores of the experimental group (5.7) after administration of amla with dates was lesser than the mean post-test anaemic status based on signs and symptoms scores of the control group (9.3). The obtained 't' value is 5.955 at df 29 was significant at 0.05 level. This indicates that the difference between the means (3.6) was a true difference and has not occurred by chance. The difference between the two means could be due to the effect of amla with dates.

The above findings coincide with the findings of Thankachan et al (2009). He revealed that "The addition of ascorbic acid had a significant effect on iron absorption". Ascorbic acid added to the rice meal in the molar ratio of 2:1 enhanced iron absorption by 291% in the IDA group and by 270% in the control group. The study thus revealed that iron status had a significant bearing on the absorption rate. According to Thankachan, the real implication of the study is that, the iron absorption can be enhanced by instituting simple dietary modifications such as addition of vitamin C containing food sources such as ripe papaya (2 to 3 slices, approximately 100 g), or guava (approximately 100 g), or lime juice (1 lime) to main meals. He opines that avoiding coffee or tea along with meals could have a favourable effect on iron absorption.

In this present study it is proved that administration of amla with dates improves the anaemic status on the adolescent girls.

Comparison of the mean post-test anaemic status based on haemoglobin score of the experimental and control group.

Table 16 shows that the mean post-test anaemic status based on haemoglobin score of the experimental group (10.87) after administration of amla with dates was higher than the mean post-test anaemic status based on haemoglobin score of the control group (9.51). The obtained 't' value is 6.72 at df 29 was significant at 0.05 level. This indicates that the difference between the means (1.36) was a true difference and has not occurred by chance. The difference between mean was due to the effect of administration of amla with dates.

The above finding was supported by following statement of Fidler et al (2009). He states that, "Vitamin C may be a particularly powerful iron absorption enhancer".

The above findings coincide with the findings of Mehnaz et al (2006). He conducted an intervention study on adolescent girls of poor community in Aligarh. It was observed that even weekly supplementation of vitamin C along with iron/folate had a significant higher increase in haemoglobin concentration (0.76g/dl), as compared to weekly iron/folate supplementation alone (0.71 g/dl) after three months of supplementation. Also daily supplementation with iron /folate demonstrated an increase in haemoglobin by 0.99g/dl at the end of three months.

The fourth objective of this study was to find out the association between the post-test anaemic status of adolescent girls with anaemia and selected demographic variables (age, type of diet, income of family and literacy status of the parents).

Association of post-test anaemic status based on haemoglobin score of the experimental group and selected demographic variables.

In order to find out the association between the anaemic status based on haemoglobin score and selected variables λ^2 was computed. While testing the association between the anaemic status based on haemoglobin score and the age of the girls, the obtained λ^2 value is 6.72 at df (1) was significant. While testing the association between the anaemic status based on haemoglobin score and the income of the family, the obtained λ^2 value is 6.37 at df (2) was significant. While testing the association between the anaemic status based on haemoglobin score and the literacy status of the mother, the obtained λ^2 value is 0.135 at df (1) was not significant. While testing the association between the anaemic statuses based on haemoglobin score and the literacy status of the father, the obtained λ^2 value is 3.731 at df (4) was not significant. While testing the association between the anaemic status based on haemoglobin score and the type of diet, the obtained λ^2 value 1.5 at df (2) was not significant.

This shows that there was an association between the anaemic status based on haemoglobin score and selected demographic variables such as age, income of the family and there was no association between the anaemic status based on haemoglobin score and selected demographic variables such as literacy status of the mother, literacy status of the father and the type of diet.

Thus it is concluded that the age of the girls and income of the family have effect on anaemic status after administration of amla with dates and literacy status of the mother, literacy status of the father, type of diet has no effect on anaemic status after administration of amla with dates.

The above report was supported by the following studies,

Jolly Rajarathinam et al., (2000) conducted a study on "prevalence of anaemia among adolescent girls of rural tamilnadu". In their study they revealed that there was a significant association found between the haemoglobin concentration and the girl's education, her mother's educational status and income of the family. This indicated that anaemia can be due to ignorance of the mother and poor socio-economic group.

In this present study there was no association between the literacy status of the mother and anaemic status. This may be due to smaller sample size. But present study proves that there was relation between family income and the anaemic status.

George, K.A. (2000) conducted a study on the pattern of anaemia and its relations to nutritional status and dietary habits. He revealed that anaemia was reported among both vegetarian and non-vegetarian were anaemic. Changes in the eating behaviour could have potentially affected the iron availability.

In the present study it reveals that there was no effect on the type of diet and anaemic status. This may be due to smaller sample size.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This chapter deals with the summary of the study and the conclusions drawn. It also deals with the limitations of study, the implications and recommendations given for different areas of nursing and for the health care delivery system.

SUMMARY OF THE STUDY

The study was undertaken to evaluate the effectiveness of intake of dates with amla on anaemic status among adolescent girls with anaemia in a selected residential school at Madurai.

The following objectives were set for the study.

- To assess the level of anaemic status before and after the administration of amla and dates among the experimental group of adolescent girls with anaemia.
- To assess the pre-test and post-test level of anaemic status among the control group of adolescent girls with anaemia
- To evaluate the effectiveness of intake of dates with amla on the anaemic status among adolescent girls with anaemia.
- To find out the association between the post-test anaemic status of adolescent girls with anaemia and selected demographic variables such as age, education, type of diet, income of family and parental education.

The following hypotheses were set for the study.

All hypotheses were tested at 0.05 level of significance:

1. The mean post-test anaemic status of adolescent girls who had dates with amla will be significantly higher than their mean pre-test anaemic status of adolescent girls.
2. The mean post-test anaemic status of adolescent girls in the experimental group who had dates with amla will be significantly higher than the mean post-test anaemic status of adolescent girls in the control group.
3. There will be significant association between anaemic status of adolescent girls and selected variables such as age, education, type of diet, income of family, and parental education.

The conceptual framework of this research was based upon J.W.Kenny's open system model. Pre-test-post-test non-equivalent control group quasi experimental design was used for this study.

Independent variable	:	Administration of dates with amla
Dependent variable	:	Improving the anaemic status among adolescent girls with anaemia

The tools used for data collection was checklist on anaemic status and cynmet haemoglobin method of haemoglobin estimation. The content validity of the tool was established by giving to seven experts in the field of paediatrics, medicine, nursing, nutrition and dietetics.

A purposive sampling method was used to select the samples for the study. A total of 100 samples were selected for identifying anaemia and out of 100 samples 60

with haemoglobin below 12mg / dl were selected and classified into the experimental and the control groups with 30 samples on random basis. Descriptive statistics (percentage, mean and standard deviation) and inferential statistics (chi-square and paired, independent t test) were used to analyse and to test the hypothesis.

MAJOR FINDINGS OF THE STUDY

1. The mean anaemic status based on signs and symptoms scores after administration of amla with dates (5.7) was lower than the mean anaemic status based on signs and symptoms scores before administration of amla with dates (10.76) in the adolescent girls. The obtained‘t’ value 10.8 at df 29 was significant at 0.05 level. This indicates that the difference between the means (5.06) was a true difference and has not occurred by chance.
2. The mean pre-test anaemic status based on signs and symptoms scores (10.5) was higher than the mean post-test anaemic status based on signs and symptoms scores (9.3) of the adolescent girls of the control group. The obtained‘t’ value is 0.4 at df 29 was not significant at 0.05 level. This indicates that the difference between the means (1.2) was a true difference and has not occurred by chance.
3. The mean anaemic status based on haemoglobin score after administration of amla with dates (10.87) was higher than the mean anaemic status based on haemoglobin score before administration of amla with dates (9.94) in the adolescent girls. The obtained‘t’ value 11.03 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.93) was a true difference and has not occurred by chance.
4. The mean pre-test anaemic status based on haemoglobin score (9.20) was higher than the mean post-test anaemic status based on haemoglobin score (9.51) in the

adolescent girls of the control group. The obtained ‘t’ value 1.9 at df 29 was not significant at 0.05 level. This indicates that the difference between the means (0.3) was a true difference and has not occurred by chance.

5. The mean fatigue score after administration of amla with dates (0.16) was lower than the mean fatigue score before administration of amla with dates (0.80) in the adolescent girls. The obtained‘t’ value 7.2 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.64) was a true difference and has not occurred by chance.
6. The mean Lack of concentration score after administration of amla with dates (0.4) was lower than the mean Lack of concentration score before administration of amla with dates (0.76) in the adolescent girls. The obtained ‘t’ value 4.2 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.36) was a true difference and has not occurred by chance.
7. The mean pica score after administration of amla with dates (0.23) was lower than the mean pica score before administration of amla with dates (0.56) in the adolescent girls. The obtained‘t’ value 3.83 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.33) was a true difference and has not occurred by chance.
8. The mean post-test fatigue score of the experimental group (0.16) after administration of amla with dates was lesser than the mean post-test fatigue score of the control group (0.76). The obtained ‘t’ value 4.69 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.6) was a true difference and has not occurred by chance.

9. The mean post-test lack of concentration score of the experimental group (0.4) after administration of amla with dates was less than the mean post-test lack of concentration score of the control group (0.6). The obtained‘t’ value 2.6 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.2) was a true difference and has not occurred by chance.
10. The mean post-test pica score of the experimental group (0.23) after administration of amla with dates was less than the mean post-test pica score of the control group (0.7). The obtained‘t’ value 2.55 at df 29 was significant at 0.05 level. This indicates that the difference between the means (0.47) was a true difference and has not occurred by chance.
11. The mean post-test anaemic status based on signs and symptoms scores of the experimental group (5.7) after administration of amla with dates was less than the mean post-test anaemic status based on signs and symptoms scores of the control group (9.3). The obtained‘t’ value 5.955 at df 29 was significant at 0.05 level. This indicates that the difference between the means (3.6) was a true difference and has not occurred by chance.
12. The mean post-test anaemic status based on haemoglobin score of the experimental group (10.87) after administration of amla with dates was higher than the mean post-test anaemic status based on haemoglobin score of the control group (9.51). The obtained ‘t’ value 6.72 at df 29 was significant at 0.05 level. This indicates that the difference between the means (1.36) was a true difference and has not occurred by chance.
13. In order to find out the association between the anaemic statuses based on haemoglobin score and selected variables λ^2 was computed. While testing the association between the anaemic status based on haemoglobin score and the age of

the girls, the obtained λ^2 value 6.72 at df (1) was significant. While testing the association between the anaemic status based on haemoglobin score and the income of the family, the obtained λ^2 value 6.37 at df (2) was significant. While testing the association between the anaemic status based on haemoglobin score and the literacy status of the mother, the obtained λ^2 value is 0.135 at df (1) was not significant. While testing the association between the anaemic status based on haemoglobin score and the literacy status of the father, the obtained λ^2 value 3.731 at df (4) was not significant. While testing the association between the anaemic statuses based on haemoglobin score and the type of diet, the obtained λ^2 value 1.5 at df (2) was not significant.

CONCLUSIONS

The following conclusions were drawn from this study

1. Iron deficiency anaemia is very common among adolescent girls (13-16 years) especially those who attained menarche. In that 74 adolescent girls had anaemia. Out of 60, 36 girls had mild anaemia, 23 girls had moderate anaemia and one girl had severe anaemia. Most of the adolescent girls had the signs and symptoms of fatigue, lack of concentration, getting irritated often and palpebral conjunctiva.
2. The mean anaemic status based on signs and symptoms score among adolescent girls after administration of amla with dates was lower than the mean anaemic status based on signs and symptoms score before administration of amla with dates.
3. The mean anaemic status based on haemoglobin score among adolescent girls after administration of amla with dates was higher than the mean anaemic status based on haemoglobin score before administration of amla with dates.

4. The mean fatigue score after administration of amla with dates was lower than the mean fatigue score before administration of amla with dates in the adolescent girls.
5. The mean Lack of concentration score after administration of amla with dates was lower than the mean Lack of concentration score before administration of amla with dates in the adolescent girls.
6. The mean pica score after administration of amla with dates was lower than the mean pica score before administration of amla with dates in the adolescent girls.
7. Dates with amla were effective in improving the anaemic status among adolescent girls with anaemia.
8. There was no association between anaemic statuses based on haemoglobin score and selected demographic variables such as literacy of father, literacy of mother, type of diet. There was association between anaemic statuses based on haemoglobin score and selected variables such as age and income of the family.

IMPLICATIONS

The findings of the present study have practical application in nursing field. The effectiveness of amla with dates in improving the anaemic status can be discussed under the following headings.

Implications for nursing practise

1. The study findings revealed the fact that the dates with amla can be used to improve anaemic status among adolescent girls with anaemia.
2. The study findings will help the nursing personnel to implement the effective use of date with amla at the community level to improve anaemic status among adolescent girls with anaemia.

3. It will also help the nursing personnel to conduct regular health assessment at paediatric outpatient department.
4. The study findings will enable the nurses and nursing students to educate the parents, teachers and children to identify the level of iron deficiency anaemia through physical assessment.
5. Instruction module can be distributed in the outpatient department and in the hospital on the uses of amla with dates in improving anaemic status.

Implications for nursing education

1. The study will help to conduct conference, seminar and panel discussion on management of anaemia with emphasis on amla and dates.
2. The success of this study will motivate the nursing personnel to include low cost dietary management such as dates with amla for iron deficiency anaemia.
3. The study will enable the nursing personnel to include physical assessment as helps to determine the level of iron deficiency anaemia.
4. The study will help the nursing students to learn about the effectiveness of dates with amla in improving the anaemic status.

Implications for nursing research

1. The study will motivate other investigators to conduct further studies related to this study which will ultimately yields more information.
2. This study will motivate other investigators to conduct further studies with large samples.
3. This study will also motivate other investigators to conduct study for longer duration.

Implications for nursing administration

1. In-service education can be organised for the nursing personnel to update knowledge in various aspects of detection and management of iron deficiency anaemia.
2. The nursing administrations can give more emphasis on conducting health check-up once in six months among adolescent girls in the school to detect iron deficiency anaemia as part of the school health programme.
3. It will help to set standards in detecting and managing iron deficiency anaemia at community level for use by school teacher and village health workers.
4. Instruction module can be prepared with measures to prevent and detect iron deficiency anaemia through physical assessment and to improve anaemic status by amla with dates as a best source of iron.
5. This will enable the nurse leaders in organising seminars, preparing audio visual aids, arranging education programme on dietary management of iron deficiency anaemia with amla with dates.

LIMITATIONS

1. Because of the short duration of the study dates with amla administration was only for a period of six weeks.
2. The setting of the study was chosen due to researcher's familiarity and not by random selection. Due to these limitations, the findings can be generalized only to the selected participants.
3. Strict supervision was limited within the school environment.

RECOMMENDATIONS

1. Similar study can be conducted for larger samples for a longer period.
2. A similar study can be done in various settings.
3. Study can be also conducted in different age groups.
4. A comparative study can be conducted with two groups one group with amla alone and other group with dates alone.
5. Study can be conducted in community settings.
6. An experimental study can be conducted with administration of amla with raisins.
7. An experimental study can be conducted with administration of orange juice with dates.
8. A comparative study can be conducted with two group's one group with amla with ragi and other group with amla with dates.

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APPENDIX-I

COPY OF LETTER SEEKING PERMISSION TO CONDUCT STUDY AT A LUCY PERRY NOBLE GIRLS HIGHER SECONDARY SCHOOL, RACHANYAPURAM , K.PUDUR, MADURAI.

Ref:UT:SHNC: 2011

To

The District Educational Officer,

Melur,

Madurai.

Sacred Heart Nursing College

Ultra trust, 4/235 ,College road,

Madurai -625020.

Respected Sir/ Madam,

Sub: Sacred Heart Nursing College, Madurai-Project work of M.Sc., (N) student- permission requested- reg

We wish to state that _____ final year M.Sc., (N) student of our college has to conduct a Research project, which is to be submitted to the Tamilnadu Dr. M.G.R Medical University, Chennai in partial fulfilment of University requirements.

The topic of research project is **'An experimental study to evaluate the effectiveness of intake of dates with amla on anaemic status among adolescent girls with anaemia in a selected residential school at Madurai.'**

We therefore request you to kindly permit her to do the research work under your valuable guidance and suggestions.

Thanking you,

Yours faithfully,

SACRED HEART NURSING COLLEGE

ULTRA TRUST, MADURAI-20

APPENDIX-II

COPY OF LETTER SEEKING EXPERT'S OPINION FOR TOOL AND CONTENT VALIDITY

From

_____

II year M.Sc., Nursing,

Sacred Heart Nursing College,

Ultra Trust, Madurai-20.

To

Respected Madam/ Sir,

Sub: Requesting opinion and suggestion of experts for tool for its validity

I am _____ II year Master Degree Nursing student in Sacred Heart Nursing College. In partial fulfilment of Master Degree in Nursing, I have selected the topic mentioned below for the research project to be submitted to the Dr. M.G.R University, Chennai.

Problem Statement:

An experimental study to evaluate the effectiveness of intake of dates with amla on anaemic status among adolescent girls with anaemia in a selected residential school at Madurai.

Hence I request you to kindly examine the tool, content and give your valuable opinion and suggestion for improvement of tool and content.

Enclosure:

- Problem Statement
- Demographic profile
- Tools

Thanking you,

Yours sincerely,

_____

Place:

Date:

APPENDIX-III

List of Experts Consulted For the Content Validity of Research Tool

1. **Dr. J. Sundara Pandiyan., M.D., D.C.H. (Pediatrics),**
   Padma Speciality Care Hospital, Madurai-02.

2. **Dr. C. Paulraj., M.B.B.S., D.C.H. (Pediatrics),**
   Government Hospital, Srivilliputtur.

3. **Dr. S. Sambath., M.D., D.C.H. (Pediatrics),**
   Professor,
   Government Rajaji Hospital, Madurai.

4. **Mrs. J.P. Jeyanthiall., M.Sc., M.Phil.,**
   Dietitian,
   Meenakshi Mission Hospital and Research Center, Madurai.

5. **Mrs. R.G. Abirami., M.Sc., M.Phil.,**
   Lecturer,
   Sacred Heart Nursing College,
   Ultra Trust, Madurai.

6. **Mrs. Jessy., M.Sc(N)., Ph.D.,**
   Lecturer,
   C.S.I. Jeyaraj Annapakiyam College of Nursing,
   Madurai.

7. **Mrs. Juliet Syilvia., M.Sc(N)., Ph.D.,**
   Professor,
   Sacred Heart Nursing College,
   Ultra Trust, Madurai.

APPENDIX-IV

DEMOGRAPHIC DATA

SAMPLE NO:

NAME:

1) Age : 13years, / 14years, /15years,/ 16years

2) Education :8th std, / 9th std, / 10th std / 11th std

3) Occupation of parents : father: mother:

4) Income of the family : below Rs2500/month,
Rs2501-Rs5000/month,
Rs5001&above/month

5) Diet : vegetarian / non vegetarian

6) Menstrual status : menarche attainted / not attained

7) Have you been dewormed? : yes / no

8) Have you been treated for anemia now? : yes / no

9) Do you have any other gastro intestinal diseases? : yes / no

10) Height &Weight :

11)Menstrual flow is : regular /irregular

12)Menstrual length in days :1-5days /5 days & above

13)Menstrual regularity of the cycle : 28-30days / 31days & above

14)Previous haemoglobin level :

15)Are you getting treatment for thalassemia and Leukaemia? : yes / no

16)Literacy status of the mother **:** Illiterate/ Primary school/ Higher secondary/ College

17) Literacy status of the father **:** Illiterate/Primary school/Higher secondary/ College

APPENDIX-V

நேர்காணல் படிவம்

பெயர் :

வயது : 13 வயது/14 வயது/ 15 வயது / 16 வயது

படிப்பு : 8ம் வகுப்பு/ 9ம் வகுப்பு / 10ம் வகுப்பு / 11ம் வகுப்பு

பெற்றோரின் தொழில் : தந்தை: தாய் :

குடும்பத்தின் மாத வருமானம் : ரூ2500க்கு கீழ்

ரூ2501க்கு முதல் ரூ5,000 வரை

ரூ 5001க்கு மேல்.

உணவு வகை : சைவம் /அசைவம்.

பூப்பெய்தல் : அடைந்து உள்ளேன் / அடையவில்லை.

வயிற்றுபூச்சி மாத்திரை

எடுத்து உள்ளீரா ? : ஆம் / இல்லை.

இரத்த சோகைக்கான சிகிச்சை முறையினை

எடுத்துக் கொண்டு இருக்கிறீர்களா? : ஆம் / இல்லை.

உங்களுக்கு வயிற்று மற்றும் குடல் சார்ந்த

நோய்கள் உள்ளதா? : ஆம் / இல்லை

தற்பொழுது உங்களின் உயரம்

மற்றும் எடை என்ன? :

மாதவிடாயின் போது இரத்தபோக்கு

சீரான நிலையில் உள்ளதா? : ஆம் / இல்லை

மாதவிடாயின் போது இரத்தபோக்கு

ஏற்படும் : 1-5 நாட்கள் / 5 நாட்களுக்கு மேல்.

மாதவிடாய் சுழற்சி இயல்பான

நிலையில் உள்ளதா? : 28-30 நாட்கள் / 31 நாட்களுக்கு மேல்.

உங்களின் முந்தைய

ஹீமோகுளோபின் அளவு என்ன? :

தற்பொழுது தலாஸ்மியா மற்றும் லுக்கிமியா நோய்க்கான

சிகிச்சை முறையினை எடுத்துக் கொண்டு இருக்கிறீர்களா? ஆம் / இல்லை.

தாயின் படிப்பு நிலை : படிக்கவில்லை / தொடக்க நிலை படிப்பு /

உயர் நிலை படிப்பு / பட்டபடிப்பு

தந்தையின் படிப்பு நிலை : படிக்கவில்லை / தொடக்க நிலை படிப்பு /

உயர் நிலை படிப்பு/ பட்டபடிப்பு

APPENDIX-VI

HEMOGLOBIN ESTIMATION

10-12 mg/dl	-	mild anemia
7-10mg/dl	-	moderate anemia
<7mg/dl	-	severe anemia

APPENDIX-VII

CHECKLIST FOR ASSESSING THE ANAEMIC STATUS

SUBJECTIVE DATA	Yes	No
Feel very tired(fatigue)while doing the physical activities like(running, walking up the stairs)	**2**	**0**
Anorexia	**1**	**0**
Lack of concentration while listening to the classes	**1**	**0**
Shortness of breath while doing physical activities like(running, walking up the stairs)	**2**	**0**
Habit of pica eating	**1**	**0**
Getting irritated often	**1**	**0**
Palpitation while doing physical activities like (lifting heavy objects)	**2**	**0**
OBJECTIVE DATA		
Pale palpebral conjunctiva	**1**	**0**
Pallor of tongue	**2**	**0**
Pallor of nails	**1**	**0**
Pallor of palm & soles	**2**	**0**
Growth retardation	**2**	**0**

SCORING KEY OF ANAEMIC STATUS

1-6 - MILD

7-11 - MODERATE

12-18- SEVERE

APPENDIX-VIII

இரத்த சோகைக்கான மதிப்பீடு பட்டியல்

கேள்விகள் மூலம் அறிதல்	ஆம்	இல்லை
ஓடும்போது, மாடிபடி ஏறும்போது ஏற்படும் அதிகபடியான சோர்வு நிலை	**2**	**0**
பசியின்மை	**1**	**0**
வகுப்பறையில் பாடம் கவனிக்கும் போது ஏற்படும் கவன குறைவு	**1**	**0**
ஓடும்போது, மாடிபடி ஏறும்போது ஏற்படும் மூச்சு திணறல்	**2**	**0**
சாம்பல், பல்பம், செங்கல் உட்கொள்ளும் பழக்கம்	**1**	**0**
அடிக்கடி எரிச்சல் அடைதல்	**1**	**0**
கனமான பொருட்களை தூக்கும் போது ஏற்படும் படபடப்பு	**2**	**0**

பார்ப்பதன் மூலம் அறிதல்

கண்ணின் இமை படலம் பழுப்பு நிறத்தில் இருத்தல்	**1**	**0**
நாக்கு பழுப்பு நிறத்தில் இருத்தல்	**2**	**0**
நகம் பழுப்பு நிறத்தில் இருத்தல்	**1**	**0**
உள்ளங்கை மற்றும் உள்ளங்கால் பழுப்பு நிறத்தில் இருத்தல்	**2**	**0**
வளர்ச்சி குறைபாடு	**2**	**0**

மதிப்பீடு

1-6 சிறிய அளவில் பாதிப்பு

7-11 மிதமான அளவில் பாதிப்பு

12-18 அதிக அளவில் பாதிப்பு