EFFECTIVENESS OF NUTRITION BALL ON HAEMOGLOBIN LEVEL AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANAEMIA AT SELECTED INDUSTRY HOSTEL IN MADURAI.

M.Sc (NURSING) DEGREE EXAMINATION

BRANCH – IV COMMUNITY HEALTH NURSING

COLLEGE OF NURSING

MADURAI MEDICAL COLLEGE, MADURAI - 20

A dissertation submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY,

CHENNAI – 600 032.

Inpartial fulfillment of requirement for the degree of

MASTER OF SCIENCE IN NURSING

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CERTIFICATE

This is to certify that this dissertation titled**, "EFFECTIVENESS OF NUTRITION BALL ON HAEMOGLOBIN LEVEL AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANEMIA AT SELECTED INDUSTRY HOSTEL IN MADURAI."** is a bonafide work done by Mrs.A.CHELLAMANI, College of Nursing, Madurai Medical College, Madurai - 20, submitted to the Tamilnadu Dr.M.G.R. Medical University, Chennai in partial fulfillment of the university rules and regulations towards the award of the degree of Master of Science in Nursing, Branch IV, Community health Nursing under our guidance and supervision during the academic period from 2012– 2014.

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ABSTRACT

A Study to evaluate the Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry Hostel in Madurai. Health is a fundamental human right and health is central to the concept of quality life. Adolescent is a period of second decade of life. Eating right food right time will prevent the nutritional deficiencies especially iron deficiency .Iron deficiency anemia is a public problem that is increasing throughout the world especially in developing countries. The study was aimed to assessing the haemoglobin level and improves the haemoglobin level through nutrition ball intervention. **Methodology** A quantitative approach Quasi experimental – one group pre test and post test design was used in this study. A sample size of 60 adolescent girls with iron deficiency anemia selected by Non probability Purposive sampling technique was used to collect the samples. The modified Abdellah's Typology of Nursing Problems model (1960) was adopted for this study. The stool used for this study was demographic variables of adolescent girls, Clinical assessment of symptoms of anemia with observation checklist, Clinical assessment of hemoglobin estimation among adolescent girls before and after nutritional intervention (Sahli's method of haemoglobin testing).**The finding** of the study reveals that the 't' value 18.48 was much higher than the table value at 0.001 (pre set level of significance was 0.05). The mean post test score of haemoglobin level will be significantly higher than their mean test score of haemoglobin level. The symptoms are reduced after nutrition ball intervention. **Conclusion.** Deworming and Nutrition ball intervention provided to the adolescent girls improved their heamoglobin level and reduced the symptoms of anemia there by incidence of complications of anemia was prevented.

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CHAPTER - I

INTRODUCTION

"Adolescence is perhaps nature's way of preparing parents to Welcome the empty nest"

- **Karen Savage**

Health is a fundamental human right and health is central to the concept of quality of life **(Sundar Lal, 2007).** A child's nutritional status can have a great impact on their growth and development. In the absence of proper nutrition a state of many nutritional problems may occur. One of the important components of RCH – II is the adolescent's health.

Adolescence, a period of transition between childhood and adulthood, occupies a crucial position in the life of human beings. This period is characterized by an exceptionally rapid rate of growth. Adolescents (both boys and girls) are at risk of developing iron deficiency and iron deficiency anaemia because of the increased iron requirements for growth.

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 teenager's growth and development. During adolescence, teenagers will acquire the knowledge and skills that will help them to become independent, successful young adults. Iron deficiency and iron deficiency anaemia can affect this learning and

development, but parents can help their teenagers stay healthy by teaching them some easy ways to prevent iron deficiency.

Iron deficiency is the most prevalent micronutrient deficiency among adolescents .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 capacity. Even before anaemia might develop, iron deficiency can cause shortened attention span, alertness and learning in adolescents.

Adolescents with chronic illness, heavy menstrual blood loss (>80 ml/month) or who are underweight or malnourished are at increased risk for iron deficiency and should be screened during health supervision or specialty clinic visits. Overweight and obese children also appear to be at increased risk for iron deficiency and should undergo screening.

According to WHO estimates, India is one of the countries in the world that has highest prevalence of anaemia WHO estimates that 27 percent of adolescents in developing countries are anaemic; the Inter National Centre of Research for Women (ICRW) studies documented high rates in India (55 percent), Nepal (42 percent), Cameroon (32 percent) and Guatemala (48 percent). Anaemia prevalence in young children continues to remain over 70% in most parts of India and Asia despite a policy being in place and a program that has been initiated for a long time.

Anaemia is not a specific entity but an indication of an underlying pathologic process or disease. As many as 4–5 billion people i.e., 66–80% of world's population may be iron deficient. More than 30% of the world's population i.e., 2 billion people

are anaemic due to iron deficiency. In total, 8,00,000 (15%) of deaths are attributed to iron deficiency. WHO lists iron deficiency as one of "Top Ten Risk Factors contributing to Death''. Iron deficiency anaemia is more common in South Asian countries including, India, Bangladesh and Pakistan than anywhere else in the world. By contrast, the prevalence of Iron deficiency anaemia in neighbouring countries such as Bangladesh and Pakistan has fallen to 55%. The reduction of Iron Deficiency Anaemia prevalence in China is especially remarkable i.e., the prevalence was halved from 20% to the current level of 8% within a decade. It is very difficult to ascertain the true incidence of Iron Deficiency Anaemia, as the aetiology of anaemia is multifactorial.

Not eating enough iron can lead to anaemia, which causes tiredness and reduces the body's ability to fight of infection. Childhood obesity figures increase as youngsters get older so it's vital that to make sure healthy options are both appealing and affordable are available to young people. The UK National Diet and Nutrition Survey, which involved more than 2,000 adults and children, found that teenage girls diets were generally less healthy than boys. Boys eat an average three portions of fruit and vegetables a day compared with 2.7 for girls.

The Third National Health and Nutrition Examination Survey (NHANES III) found a 9 percent incidence of iron deficiency and a 2 percent incidence of anaemia among American females between the ages 12 and 18years; the respective values were 11 and 3 percent in girls between the ages of 16 and 19 years. Less than 1 percent of adolescent males had iron deficiency .Studies in other countries have found higher rates of iron deficiency in male and female adolescents. The National Family Health Survey (NFHS-3) conducted at India in 2007-2008, While 56 per cent of

adolescent girls are anaemic, boys too are falling prey to the disease. Around 30 per cent of adolescent boys are suffering from anaemia.

Iron deficiency is the most common cause of anaemia in adolescents in the United States, and 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.

Iron deficiency anaemia is primarily due to inadequate intake of food, both in quantity and quality. In availability of nutritional food, lack of money for purchasing food, traditional beliefs and taboos about child's diet and in sufficient balanced diet are resulting in anaemia. It is the underlying and associated cause of childhood illness and death among the pre-school age group. It makes the child susceptible to infection, and lower recovery from illness.

In 2008, World Health Organization global estimates of anaemia prevalence averaged 56%, with a range of 35–75% depending on geographic location. Prevalence of anaemia in South Asia is among the highest in the world, mirroring overall high rates of malnutrition.

The pre-pregnancy anaemic status of adolescent girls is crucial and has long-term intergenerational consequences as the anaemic adolescent mother is at high risk of miscarriages, maternal mortality and giving birth to still born and low birth weight babies with low iron reserves. Evidence also supports that bodies of the still growing adolescent mother and her baby may compete for nutrients, raising the infant's risk of low birth weight.

Teenage years are an important first opportunity to be responsible for their own food choices, so it's worrying that so many in this age group are still not getting the nutrition properly. Malnourished children are prone to develop continuous bouts of some illness. This condition can be easily set right if we eat the right food in the right amount daily i.e., if the children's consume a balanced diet every day and develop good eating habits for good health.

1.1 NEED FOR THE STUDY

" The adolescent girls still remains a young plant that neither gets light nor water, she remains the flower that could have blossomed but didn't....

Kamala Bhasin

'Sadly it's surprising that teenage girls have a worse diet than their male counterparts as pressure on females to stay slim seems to be starting at an increasingly young age. The youngsters diets are becoming increasingly unhealthy and higher numbers are becoming overweight. This focus on weight could be taking its toll on some of their vitamin and mineral intake, creating a nutritional gap which could lead to its own health issues in the future.

In World 40% of population suffer from anaemia especially, adolescent 30-55% .Iron deficiency is the most common micronutrient deficiency which affects more than 2 billion of the population worldwide, leading to anaemia in more than 40% of women of reproductive age in the developing world and 7- 12 percent in developed countries . Estimates suggest that over one third of the world's population suffers from anaemia, mostly iron deficiency anaemia

According to ICRW (International centre for research on women), India has the highest prevalence of iron deficiency anaemia among women in the world, including 60-70 percent if Indian adolescent girls are anaemic. Prevalence of anaemia in India is high because of low dietary intake, poor availability of iron and chronic blood loss due to hook worm infestation and malaria. While anaemia has well known adverse effects on physical and cognitive performance of individuals, the true toll of iron deficiency anaemia lies in the ill-effects on maternal and foetal health.

(K.Park,2009)In Tamilnadu 1-10 per 100 adolescent girls are prone for anaemia (Government of Tamilnadu 2006).As per district level health survey (DLHS 2002-2004) prevalence of anaemia in adolescent girls is very high (72.6%) in India with prevalence of sever anaemia among them much higher (21.1%).

The National Family Health Survey (NHANES 3) conducted in 2005-06, 56% of adolescent girls are anaemic. In another study, data from The National Family Health Survey (NHANES III) were examined for an association between iron deficiency and weight. The prevalence of iron deficiency increased as body mass index increased from normal weight to >85th percentile for age and sex to >95th percentile for age and sex (2.1 percent, 5.3 percent, and 5.5 percent, respectively). Obesity was a risk factor for iron deficiency anaemia in both boys and girls, but rates were approximately three times higher in girls. The etiologic of anaemia in obese individuals is uncertain but may be related to low-quality diets or increased needs relative to body weight.

The prevalence of iron deficiency anaemia is 2 percent in adult men, 9 to 12 percent in non-Hispanic white women, and nearly 20 percent in black and Mexican-American women. Nine percent of patients older than 65 years with iron deficiency

anaemia have a gastrointestinal cancer when evaluated. The U.S. Preventive Services Task Force currently recommends screening for iron deficiency anaemia in pregnant women and adolescent but not in other groups. Routine iron supplementation is recommended for adolescent girls.

The study was carried out by National Nutrition Monitoring Bureau in Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, and West Bengal. Objectives of the study to estimate haemoglobin level among preschool children, adolescent girls, and pregnant and lactating women. A total of 75600 HHs from 633 villages were covered. 3291 preschool children, 6616 adolescent girls, 2983 pregnant women, and 3206 lactating mothers were covered for haemoglobin estimation. The lowest mean haemoglobin level was found among adolescence (9.9g/dl), followed by preschool children (10.3 g/dl), lactating women (10.6 g/dl). There is an urgent need for improving the implementation of national nutrition programmes and strengthening nutrition education.

Iron needs are higher in adolescent girls after the onset of menstruation because of monthly blood loss. An important risk factor for iron deficiency anaemia is heavier than normal menstrual bleeding, adolescent females often do not get enough iron to keep up with menstrual losses. They especially do not want to talk about how heavy their periods are. They are often very sensitive about their diet and their body image. 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 anaemia in adolescents. In spite of increased iron needs, many adolescents, especially females, do not get enough iron

from their diets. About 75% teenage girls, do not meet their dietary requirements for iron, compared to only 17% of teenage boys.

Iron metabolism is unusual in that it is controlled by absorption rather than excretion. Iron is only lost through blood loss or loss of cells as they slough. Men and non menstruating women lose about 1 mg of iron per day. Menstruating women lose from 0.6 to 2.5 percent more per day. An average 132-lb (60-kg) woman might lose an extra 10 mg of iron per menstruation cycle, but the loss could be more than 42 mg per cycle depending on how heavily she menstruates. A pregnancy takes about 700 mg of iron, and a whole blood donation of 500 cc contains 250 mg of iron.

Cross-sectional study done in three villages near Pune city, to determine social dimensions related to anaemia among women of child bearing age (15-35). To examine various socio demographic aspects related to consumption of micronutrient-rich foods like green leafy vegetables, samples are 418 women's. Data collected to determine socio-economic and anthropometric (weight, height) variables, Hb, dietary pattern and peripheral smear examination for classifying nutritional and iron-deficiency anaemia. The findings highlight that low consumption of green leafy vegetables, which are treasures of micronutrients including iron, is associated with genuine social reasons. This indicates a need for developing action programmes to improve nutritional knowledge and awareness leading to enhanced consumption of iron-rich foods for preventing anaemia in rural India.

The best sources of iron include iron fortified cereals, dried beans and legumes, clams, oysters, leafy greens, nuts and whole grains. The Government advises that everyone tries to eat at least five portions of fruit and vegetables a day to reduce

the risk of heart attacks, stroke, and diabetes and bowel cancer, one of the commonest form.

The symptoms accompanying iron deficiency depend on how rapidly the anaemia develops. In cases of chronic, slow blood loss, the body adapts to the increasing anaemia and patients can often tolerate extremely low concentrations of haemoglobin. For example, < 7.0 g/dl, with remarkably few symptoms. Most patients complain of increasing lethargy and dyspnoea. More unusual symptoms are headaches, tinnitus and taste disturbance.

Iron deficiency anaemia is caused by defective synthesis of haemoglobin, resulting in red cells that are smaller than normal (microcytic) and contain reduced amounts of haemoglobin (hypochromic). Iron metabolism Iron has a pivotal role in many metabolic processes, and the average adult contains 3–5 g of iron, of which two-thirds is in the oxygen carrying molecule haemoglobin. A normal Western diet provides about 15 mg of iron daily, of which 5–10% is absorbed (~1 mg), principally in the duodenum and upper jejunum, where the acidic conditions help the absorption of iron in the ferrous form. Absorption is helped by the presence of other reducing substances, such as hydrochloric acid and ascorbic acid. The body has the capacity to increase its iron absorption in the face of increased demand, for example, in menstruation, pregnancy and lactation.

During my occupational health posting, I came across an experience of adolescent girls with less haemoglobin level. This factor provoked me to concentrate in Adolescent anaemia. Thus the investigator felt a need to undertake a study.

1.2 STATEMENT OF THE PROBLEM

A Study to evaluate the Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry Hostel in Madurai.

1.3 OBJECTIVES

- To assess the haemoglobin level among adolescent girls at selected industry hostel in Madurai.
- To evaluate the effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.
- To determine the association between the post test level of haemoglobin among adolescent girls with their selected demographic variables.

1.4HYPOTHESES

H_1 There will be a significant difference between pre-test and post test score of haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.

H_2 There will be significant association between the post test level of haemoglobin among adolescent girls with selected demographic variables.

1.5 OPERATIONAL DEFINITION

EFFECTIVENESS:

In this study it refers to determine the extent to which the nutrition ball has achieved the desired effects in improving the level of Haemoglobin among adolescent girls as elicited by blood analysis. (sahli's haemoglobin test).

NUTRITION BALL

In this study it refers to the iron rich supplement it includes seasame seeds 25gms, Bengal gram 25gms, ragi 25gms,Jagerry 50gms and Amla 10gms were prepared hygienically, all ingredients are powdered and added with jaggery powder and made into a ball.

HAEMOGLOBIN (Hb) LEVEL

In this study it refers to the extent to which the range of Hb from less than 12 gm/dl to the desirable changes brought by the intake of nutritional ball among adolescent girls.

ADOLESCENT GIRLS

In this study it refers the adolescent girls who are at the age group of 17- 19 years working in selected industry and stay in industry hostel at Madurai.

IRON DEFICIENCY ANAEMIA

In this study it refers to the decreasing different range of Haemoglobin level of the adolescent girls less than normal which is identified through sahli's haemoglobin test and associated symptoms of anaemia and diagnosed iron deficiency anaemia.

1.6 ASSUMPTION

1. Adolescent girls are prone to develop the iron deficiency anaemia due to menstruation, insufficient iron in the diet and poor absorption of iron in the body.
2. Dietary intake of iron supplement in form of nutritional ball will improve the level of haemoglobin among adolescent girls.

1.7 DELIMITATION

- The study is limited to adolescent girls with iron deficiency anaemia working in industry and staying in hostel.
- Data collection period is limited for 4 weeks**.**

1.8 PROJECTED OUTCOME

The study will reveal the importance of nutrition ball intervention increasing the haemoglobin level among iron deficiency anaemia.

CHAPTER – II

REVIEW OF LITERATURE

This chapter presents a review of related literature relevant to the study. A review of literature related research and theory on a topic has become a standard and virtually essential activity of scientific research projects " Review of literature is a critical summary of research on a topic of interest, often prepared to put a research problem in contact or as the basis for an implementation project" Review of literature was under- taken to gain depth knowledge on various aspect of the problem under this study.

The literature gathered from extensive review of electronic media were depicted under the following headings

The section has two parts

Part – A : Review of Literature

Part – B : Conceptual frame work

PART – A

REVIEW OF LITERATURE

In this study the relevant literature reviewed has been organized and presented under the following headings.

1. Literature related to Prevalence of iron deficiency anaemia among adolescent girls.
2. Literature related to Factors and symptoms to iron deficiency Anaemia
3. Literature related to iron deficiency anaemia and changing dietary behaviours among adolescent girls.

1. LITERATURE RELATED TO PREVALENCE OF IRON DEFICIENCY ANAEMIA AMONG ADOLESCENT GIRLS.

Meenal ,VK., Durge, PM., Kasturwar, NB. (2012). A cross sectional community based study was conducted among 272 adolescent girls in an urban slum area under Urban Health Training centre, department of Community Medicine, NKP Salve Institute of Medical science, Nagpur from June 2009 to February 2010. Out of five areas one area was selected by simple random sampling. Information regarding socio-demographic and menstrual factors was recorded in pre-designed, pre-tested proforma. Haemoglobin estimation was done by Sahli's haemoglobin meter. Data was analyzed by mean, standard deviation and chi square test. The study result shows that the prevalence of anaemia was found to be very high (90.1%) among adolescent girls. Majority of the girls were having mild or moderate anaemia (88.6%). The study concluded that nutrition education along with nutritional supplementation and iron folic acid tablets should be provided to all girls.

Beena Sachan., MZ Idris., Ashutosh Singh. **(2012)** A cross-sectional descriptive study was carried out among school going adolescent girls in urban as well as rural schools of the Lucknow district, Uttar Pradesh, India. Multistage random sampling was used to select the requisite number of girls. A total of 847 school going adolescent girls between 10-19 years of age were interviewed. Information regarding their socio-demographic characteristics was collected and the girls were also examined for presence or absence of pallor for anaemia. The prevalence of anaemia was found to be 55.6% and 57.9% in urban and rural school going adolescent girls respectively and significant association of anaemia was observed with religion, caste and socio-economic status (p value<0.05). There is need to develop strategies for nutrition education and dietary supplementation including anaemia prophylaxis.

Premalatha, T., Valarmathi, S., Srijayanth, P., Sundar, JS., Kalpana, S. (2012) A cross-sectional survey was executed to estimate the prevalence of iron deficiency anaemia among adolescent school girls in Chennai, Tamil Nadu. A sample of 400 female school students in the age group of 13-17 years were selected by using stratified random sampling method. Socio demographic details, anthropometric measurements were obtained. Haemoglobin was estimated using cyanmethaemoglobin method. Study results shows that the prevalence of anaemia was found to be 78.75% among school students. Chi-square statistics shows significant association ($p<0.05$) of anaemia is with type of family, socioeconomic status and diet. In this study 42.5% of girls with BMI<18 were found to be anemic. This study predicts that haemoglobin level tends to decrease as age progresses.

Shilpa,S. Biradar,R.,et.al.(2012) A cross-sectional study was conducted to assess the prevalence and the severity of anaemia among adolescent girls in rural areas which was conducted for a period of one year at villages which were under

Vantamuri PHC, Belgaum. A total of 840 adolescent girls (10-19 years of age) were included in the study. A pre-designed and pre-tested proforma was used to obtain the details of the socio-demographic variables. A relevant clinical examination of the participants was done. The blood samples were analyzed by using an automated cell counter. The diagnosis was established as anaemia when the haemoglobin level was less than 12gm/dl. The study results revealed that the prevalence of anaemia was 41.1% (with that of severe anaemia being 0.6%, that of moderate anaemia being 6.3% and that of mild anaemia being 34.6%). It was observed that the prevalence of anaemia was high in late adolescents (15-19yrs) as compared to that in the early adolescents (10-14yrs). A majority of the girls had mild anaemia. The prevalence of anaemia was considerably high among the girls who belonged to the low socio-economic status. The study concluded a high prevalence of anaemia was found among the adolescent girls, which was considerably high in the late adolescents. There was a significant association of anaemia with the socio-economic status.

Ramzi ,M., et.al. (2011).A cross sectional study was conducted to investigate the prevalence of anaemia, iron deficiency anaemia and related risk factors in adolescent school girls in Kavar urban area in southern Iran. A total of 363 adolescent school girls were evaluated. Socioeconomic, demographic and related risk factors were obtained by a questionnaire. Hematological parameters and serum iron indices were measured. The study results shows that there were 21 cases of anaemia (5.8%), 31 (8.5%) iron deficiency and 6 (1.7%) iron deficiency anaemias. Most of anemic girls (85.7%) had mild anaemia. MCV, TIBC, age, and BMI had statistically significant relationship with haemoglobin. Only parasites infestation in the last three months had a 6.83 times more risk of anaemia than those without this history .

Siddharam, S .M., Venketesh, G. M., Thejeshwari, H. L. (2011) A cross sectional survey was conducted in selected anganwadi centres of rural area of Hassan district. The study was conducted to estimate the prevalence of anaemia among adolescent girls and to study the socio demographic factors associated with anaemia. A sample of 314 adolescent's girls (10-19 yrs old) was included in the study. The study was conducted from February to April 2011 (3 moths).Data analysis was done by using proportions and Chi-square test. The study result shows that the prevalence of anaemia was found to be 45.2%. A statically significant association was found with iron deficiency anaemia, weight loss and anaemia, pallor and anaemia. In the present study it was seen that among the 45.2% of anaemic adolescent girls 40.1% had mild anaemia, 54.92% had moderate anaemia and 4.92% had severe anaemia. The study was concluded that a high prevalence of anaemia among adolescent girls was found, which was higher in low economic strata. It was seen that anaemia affects overall nutritional status of adolescent girls.

Wankhade., et. al.(2011) A study was designed to investigate the prevalence of anaemia, a common low haemoglobin condition, in young female population of Aurangabad region (MS).108 female college students participated in the study. The haemoglobin (Hb), level was measured using Sahli's haemoglobinometer. Anaemia was defined as a situation where Hb is less than 12 g/dl. Further the anaemia was categorized into severe, moderate and mild based on the Hb levels. The study result shows the prevalence of anaemia was 83.34 percent. Normal haemoglobin status was found in 16.66 percent of the subjects. The study was concluded that anaemia is common among 18 to 25-year old females of Aurangabad region .

Shams, S., Asheri, H., Kianmehr, A. (2010), A cross-sectional study of the prevalence of iron deficiency anaemia at Iran in Iranian females aged 18–25 years old. A detailed physical examination was conducted on all the participants. Serum iron and total iron binding capacity levels were measured using a commercially available kit . The haemoglobin (Hb) and mean corpuscular volumes (MCV) were analysed on the cell counter. The concentration levels of serum ferritin were measured using radio-immunoassay. Their ages ranged from 18 to 25 years, with a mean age of 19.8 years. Among the 224 participants 118 (52.7%) had a normal iron status (Group 1), nine (4.0%) suffered from Iron Deficiency Anaemia (IDA) (Group 3) and 97 (43.3%) had Iron Deficiency (ID) without anaemia (Group 2). There were a significant differences in terms of the ferritin, iron and TS levels between the ID and normal groups ($p < 0.00005$). Considerable differences were also found for all the indices between the ID and IDA groups ($p < 0.00005$). The indices of the iron status were significantly different between the normal and IDA groups ($p < 0.00005$).

NFHS report. (2009) Anaemia is on the rise in India Adolescent in India goes hand with iron deficiency anaemia . The national family health survey (NFHS-3) conducted in 2005-2006, presents statistic that mark a growth in cases pertaining to anaemia, 56% of adolescent girls are suffering from anaemia.

Manoranjan Pal et al., (2009).) An analytical study conducted to assess the prevalence of anaemia among girls from households the North-eastern states. The Majority 74(88%) adolescent girls belonged to Hindu religion only 10 (12%) girls were Christians. The highest prevalence of anaemia among the North-eastern states was observed among girls from households with a low standard of living, non-

Christian girls, girls from Scheduled Tribes. The highest percentages of girls with normal haemoglobin were reported among Christian Scheduled Tribes.

WHO. (2009) Iron deficiency is the most common nutritional disorder in the world, 4 to 5 billion people, 66 – 80% of the world's population may be iron deficient**,** 2 billion people over 30% of the world's population are anemic , mainly due to iron deficiency anaemia in developing countries.

Toteja GS., et al. (2009) Indian council of Medical Research conducted a survey to assess the status of anaemia among adolescent girls (n=4337) from 16 districts of 11 states in India. A two-stage random sampling method was used to select 30 clusters on the basis of probability proportional to size. Aanaemia was diagnosed by haemoglobin concentration in the blood with cyanmethaemoglobin method. The survey data showed that the overall prevalence of anaemia was 90.1% , with 7.1% having severe anaemia (Hb<70g/L).

Verma, A., (2008) A cross sectional survey was conducted majority 64(76.2%) girls had the habit of drinking coffee/tea, 39(46.4%) girls had habit of drinking once a day, 23(27.4%) had habit of drinking twice a day and 2(2.4%) girls had habit of drinking coffee/tea more than two times in a day and 20 (23.8%) girls had no habit of drinking coffee/tea. Anaemia was found to be higher among girls with the attributes of those with habit of post meal consumption of tea/coffee.

Ahmed,F., Khan, MR., et al. (2008) A cross-sectional study was conducted to investigate the prevalence of selected micronutrient deficiencies amongst anaemic adolescent schoolgirls in rural Bangladesh and to examine their relationship with haemoglobin (Hb) levels.310 anaemic adolescent girls aged 14–18 years were selected . Information on personal characteristics, food habits,socio-economic

conditions, anthropometric data and blood samples were collected following the interview. The study result shows that the 28% of the girls had depleted iron stores (serum ferritin o12.0 mg/l), 25% had folic acid deficiency (red blood cell folic acid o317 mmol/l), 89% had vitamin B2 (erythrocyte glutathione reductase activity coefficient X1.4) and 7% had vitamin B12 deficiencies (serum vitamin B12 o150 mmol/l). The study concluded that only iron and vitamin B2 concentrations were found to be related to the Hb concentration.

Chaudhary, SM., Dhage, V.R.(2008) A cross-sectional survey was conducted to estimate the prevalence of anaemia among adolescent females and to study the socio-demographic factors associated with anaemia in an urban area Nagpur. A total of 296 adolescent females (10–19 years old) were included in this study. The study result shows that the prevalence of anaemia was found to be 35.1%. A significant association of anaemia was found with socio-economic status and literacy status of parents. Mean height and weight of subjects with anaemia was significantly less than subjects without anaemia. It was seen that anaemia affects the overall nutritional status of adolescent females.

Akramipour, R., Rezaei , M. (2008) A cross-sectional study was conducted to determine the prevalence of iron deficiency, iron deficiency anaemia and anaemia among adolescent school girls aged 14-20 years from 20 different high schools located in three educational areas of Kermanshah, the capital of Kermanshah province in Western Iran. There were 47 girls (12.2%) with iron deficiency anaemia (Hb<12 g/dl and ferritin <20 microg/l). Around 57.3% of anemic girls were iron deficient. The mean levels of haemoglobin (Hb), hematocrit (Hct), mean corpuscular volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration

(MCHC) in studied adolescent girls from Western Iran were found to be lower than those reported for females aged 12-18 years. In conclusion, regarding the detrimental long-term effects and high prevalence of iron deficiency, iron deficiency anaemia and anaemia in Kermanshah, Western Iran its prevention could be a high priority in the programs of health system of the country and supplementation of a weekly iron dose is recommended.

Barugahara Evelyn Isingoma. (2008) Assessment of prevalence and associated causes of anaemia among school girls of age 11- 14years in Masindi District, Western Uganda was done by a cross –sectional survey and the overall prevalence of anaemia was found to be (45.9%) among the 109 students. The prevalence was higher in urban schools (61 %)than rural schools (30.9%). There was more consumption of plant food of low iron bioavailability than animal food. This resulted in majority of pupils having less than recommend intake of iron (50.5%).

Sanjeev. M. Chaudhary. (2008). A cross-sectional survey was conducted in an urban area under Urban Health Training Center, Department of Preventive and Social Medicine, Government Medical College and Hospital, Nagpur to estimate the prevalence of anaemia among adolescent females and to study the socio-demographic factors associated with anaemia. Haemoglobin estimation was done by the cyanmethaemoglobin method using a Klett-Summerson photoelectric colorimeter with green filter and the prevalence of anaemia was found to be 35.1%.

Sabita Basu et al., (2008) In the present study, family' monthly income of a major proportion 43(51.2%) girls was less than 5,000, 7(8.3%) girls had family income of more than 10,000 and 34(40.5%) girls had family income of 5,000-10,000. Studies reported prevalence of anaemia was lower in adolescent girls where the

household income was more than Rs. 5000 per month and a higher prevalence where the household income was less than Rs. 5000 per month.

Journal of Elsevier periodicals. (2008) A study was conducted on intestinal parasitic infections especially helminthes represents a major public health problem that increase iron deficiency anaemia in developing countries. This study investigated the prevalence, risk factors and nutritional consequences of IPI in 180 adolescent girls aged 12-17 years, 50% of them subjectswere infected with at least one IPI, 2% with helminthes, 41% with protozoa and 7% with two or more intestinal parasites.

Sharda Sidhu.et.al, (2008) A cross sectional survey was conducted in selected schools tres of rural area of Hassan district Age of the adolescent girls with anaemia varied between 12 years to 15 years. Only one (1.2%) girl was 12 years of age, 28 girls were 13 years of age, 51 (60.7%) girls were 14 years of age and four (4.8%) were 15 years of age. The present study revealed that the prevalence of anaemia increased with the age of adolescent girls the majority of girls 60.7% were 14 years of age and only 1.2% was 12 years of age. A study conducted on prevalence of anaemia among adolescent girls of scheduled caste community, the study revealed an age differential in the prevalence of anaemia. The prevalence of anaemia increases with age and becomes maximum in the age group 15+.

Choudary et al., (2007) conducted a cross sectional study to assess anaemia among unmarried adolescent girls in South India, 100 adolescent girls, aged from 11 to 18 years were selected as samples by purposive sampling method. Blood samples were collected and haemoglobin test was done. The result showed that 29% of adolescent girls were affected with severe anaemia, rest of them had mild anaemia 71% ($P<0.05$). Anaemia has a significant association with low socio economic status,

religion and reporting of infrequent or non-consumption of meat. He concluded that the haemoglobin status of the adolescent girls needs to be improved through dietary modification along with the iron supplements and nutritional education.

Dreyfuss., et al. (2007) conducted an analytical study to assess the anaemia among Indian adolescent girls under the project by Health and Family Welfare Bureau. Blood collection was done and serum ferritin, peripheral blood smear and Haemoglobin test were done and analysis was carried out. The result showed that in India severe anaemia ranges from 1.6% to 11.7% among adolescent girls, moderate anaemia seen in rural area were more (38%) than in urban (11.9%) area ($P< 0.05$). He concluded that the adolescent girls are vulnerable to iron deficiency anaemia, which interferes in their physical capacity and work performance. Adolescent period is the preparatory period for the physical development for the future mothers. The young reproductive age group women are more susceptible to anaemia, because of their poor dietary intake.

Sunitha, et al. (2007) conducted a descriptive study to assess the prevalence of anaemia among adolescent girls in Jhirli. Random sampling technique was used and 105 school going adolescents were selected as samples. Blood samples were collected and analyzed and a record of one-week dietary recall was maintained. The result showed that 82% of girls were anemic based on their dietary intake ($P= 0.15$). The report was concluded that anaemia is an emerging problem among the world population, nearly 2000 million adolescent girls are suffering from this iron deficiency anaemia.

Toteja, G.S., Singh, P., Dhillon, B.S., et al (2006). A cross sectional study to assess the status of anaemia among pregnant women and adolescent girls from 16 districts of 11 states of India. A two-stage random sampling method was used to select 30 clusters on the basis of probability proportional to size. Anaemia was diagnosed by estimating the haemoglobin concentration in the blood with the use of the indirect cyanmethaemoglobin method.The survey data showed that 84.9% of pregnant women (n = 6,923) were anemic (haemoglobin < 110 g/L); 13.1% had severe anaemia (haemoglobin < 70 g/L), and 60.1% had moderate anaemia (haemoglobin > or = 70 to 100 g/L). Among adolescent girls (n = 4,337)from 16 districts, the overall prevalence of anaemia (defined as haemoglobin < 120 g/L) was 90.1%, with 7.1% having severe anaemia (haemoglobin < 70 g/L).

Karur,S. (2006).A cross–sectional study was conducted to find out the epidemiological correlates of nutritional anaemia among adolescent girls with anaemia at rural Wardha. The prevalence of anaemia was 59.8%.The prevalence of severe, moderate, mild anaemia was 0.6%, 20.8% and 38.4% respectively. The important corelates of anaemia was found to be vegetarian diet, excessive menstrual bleeding, iron intake and worm infestation

Dr. Thirumanidevi .(2006) In India 62% of girls in the age group of 10- 19 years were found to be anemic . A higher prevalence of anaemia (43%) was observed in vegiterian girls and their haemoglobin level was less than 12g/dl whereas 28% of non vegetarian girls had haemoglobin less than 12g/dl.

Suman.K.et.al (2006) conducted a cross sectional study to screen out the health pattern of the adolescent girls in the age group of 10-14 years. A total of 110 healthy adolescents were taken as samples by random sampling technique. Diet survey and

serum haemoglobin level were assessed. The result showed that less than 10% of the girls had 12gm/dl of haemoglobin and others were anemic with haemoglobin level in the range of 6 to 11.9 gm/dl ($p<0.05$). The report concluded that the daily food allowance for adolescent girls were inadequate for which the amount of iron and vitamins should be increased.

Sabita. (2006) conducted a descriptive study to assess the prevalence rate of anaemia among school going adolescents at Jabalpur. A sample of 183 adolescents was taken from the age group of 12 to 18 years. The estimation of haemoglobin was done by cyanmethaemoglobin method and serum Ferritin was estimated. The overall prevalence of anaemia was significantly higher among the girls (23.9%) when compared to boys (3.75%). Anaemia was observed more among rural (25.4%) adolescents than urban (14.2%) adolescents. There was a deficiency of 81.7% and 41.6% of serum Ferritin among adolescent girls and boys respectively

Nandita.(2006) conducted a descriptive study to assess the prevalence of anaemia and impact of anaemia control programme among adolescent girls for which 512 school going adolescent girls were selected. The result showed that the prevalence of anaemia in adolescent girls to be 80.6%. Dietary intake of the adolescent girls revealed that there was an inadequate intake of food. Almost 90.9% of adolescent girls were consuming less than 50% of required dietary allowance, the finding showed that there was a high prevalence of anaemia among the study population ($P< 0.001$) due to inadequate intake of food and there by a poor dietary intake of iron.

Pawashe (2006) conducted a study regarding iron nutritional status of adolescent girls belonging to an urban slum and rural areas. Overall anaemia was observed in 25% of the girls irrespective of their residence. A higher percentage of rural girls (37.5%) especially below the age of 12 years showed evidence of anaemia. Thereafter, the prevalence was similar in both urban and rural girls who had not attained menarche. With increasing age, urban girls who had attained menarche showed an increase in the prevalence of anaemia. The prevalence of iron deficiency (serum ferritin < 12 mcg /dl) showed a progressive increase from 28% to 60% over 12 years especially in the girls (P= 0.03). Findings suggested that distribution of iron and folate tablets to correct anaemia to the vulnerable groups is essential.

2. Literature related to Factors and symptoms Related to iron deficiency Anaemia:

Neetu Gupta, (2010). Aa descriptive study conducted on symptoms of anaemia at Jabalpur.The study revealed that majority 36(42.9%) girls had history of shortness of breath on exertion, 36 (42.9%) girls had complaint of easy fatigability, and 41(48.8%) girls had loss of appetite. In a study on supplementation effect of iron and folic acid capsule on anemic adolescent girls it was reported, that majority of subjects participated in the study complained for lethargy (72.22%) and breath-lessness on exertion (64.81 %) Problem of anorexia was faced by about (35.18%) of the subjects.

Asheri, H., Kianmehr, A (2010) An analytical study conducted among Indian adolescent girls to physical examination of adolescent girls with mild anaemia depicted that, majority of girls 48 (57.1%) girls had pale conjunctiva. Appearance of tongue was pale color for 34(40.5%) girls. 14 (28.6%) girls had pale skin and pale

face. In a study on supplementation effect of iron and folic acid capsule on anemic adolescent girls the symptoms of anaemia were observed among all the subjects with wide range of variation. Paleness of eyes was in maximum number of the subjects (62.96 %). However, the paleness of skin and flat nails were found in (66.66%) and (33.33%) percent of subjects respectively.

Lloyd Van Winkle, (2009). A descriptive study conducted to assess menstrual history the of anaemia among adolescent girls in Jhirli: Among 84 girls, 79(94%) girls had regular flow of menstruation and 5(6%) girls had irregular menstrual flow, only 1(1.2%) girl had excess flow of menstruation her haemoglobin level was 10.2 gm/dl. Among girls, however, menstruation increases the risk for iron deficiency anaemia throughout their adolescent and childbearing years. An important risk factor for iron deficiency anaemia is heavier menstrual bleeding.

Verma, A., (2008). A cross-sectional descriptive study was carried out among school going adolescent girls in urban as well as rural schools of the Lucknow district, Uttar Pradesh, India. Most of the girls 73(86.9%) were non-vegetarian and 11(13.1%) girls were vegetarian. Majority 64(76.2%) girls had the habit of drinking coffee/tea, 39(46.4%) girls had habit of drinking once a day, 23(27.4%) had habit of drinking twice a day and 2(2.4%) girls had habit of drinking coffee/tea more than two times in a day and 20(23.8%) girls had no habit of drinking coffee/tea. Anaemia was found to be higher among girls with the attributes of those with habit of post meal consumption of tea/coffee

Stoltzfus (2008). A cross-sectional study was conducted A on epidemiology of iron deficiency anaemia in Zanzibari schoolchildren .With regard to history of worm infestation, only five (6%) girls had done de-worming in the past, majority

79(94%) girls had not done de-worming in the past. Most of the girls, 51(61%) had toilet facility at home, 26(21.5%) girls practiced open field defecation and only 7(5.9%) used the public toilet. In school all the 84(100%) girls used the toilet facility.79(94%) girls used chappals while going to toilet, 5(6%) used no chapels while going to toilet.46(54.8%) girls washed hands with soap and water after each defecation,38(45.2%) girls washed with plain water after defecation. Reported that worm infestation has influence on anaemia largely. It was found that 25% of all anaemia, 35% of iron deficiency anaemia and 73% of severe anaemia was attributable to hookworm infection.

Goel. S.,(2007). A cross sectional survey was conducted in selected anganwadi centres of rural area of Hassan district.Among 84 girls, 30(35.7%) girls had history of dizziness, 28(33.3%) girls had history of palpitations. In another study on prevalence of anaemia, it was observed that the signs and symptoms headache, fatigue, dyspnoea, palpitations, and syncope attacks were significantly more prevalent in anemic subjects.

3. Literature related to iron deficiency anaemia and changing dietary behaviours among adolescent girls.

Hafzan Yusoff., Wan Nudri Wan Daud., Zulkifli Ahmad. (2013) This study which was started in year 2010 involved 280 respondents (223 girls, 57 boys, age: 16 yr) from schools in Tanah Merah. The selection criteria were based on haemoglobin level (Hb = 7 – 11.9 g/dL for girls; Hb = 7 – 12.9 g/dL for boys). They were divided into 2 groups. The first group received nutrition education package , whereas another group was entitled to receive non-nutrition education intervention y. Both interventions were implemented for 3 months. The changes in awareness among

respondents of both groups were evaluated using multi-choices questionnaire. Nutrition education receiver group demonstrated improvement in awareness at post-intervention. No substantial improvement was demonstrated by the counterpart group.

Jyoti Sajjan, B., Kasturiba., Rama, K. Naik., Pushpa, C,. Bharati. (2011) A experimental study was conducted to determine the impact of nutrition education intervention on the haemoglobin status of 60 anemic rural adolescent girls aged between 13-16years for three months. Eperimental and control of 30 each. The experimental group was further divided into two groups as student communicators(n=10) and student communicators (n=20). The student communicators were given three days nutrition education training by nutrition experts on the identified areas using the educational materials like charts, posters, blow-ups, messages and power point presentations on the importance of iron. The communicators were asked to pass on the information to communicate group. The pre and post scores of the experimental and control groups were assessed. The student t-test showed significant difference between the mean knowledge within the experimental group. In the communicators group, a significant increase (7.70%) in the haemoglobin level was observed. Hence, from the study it can be concluded that, nutrition education is one of the appropriate, effective and sustainable approach to combat iron deficiency anaemia.

N . Yadav., AR Kumar., S. Srivastava., PraveenKumar., S.Sharma .(2011) An experimental study was conducted in Allahabad for adolescent girls (13 -18 years).In this study 33 subjects were taken in experimental group, while 40 were taken as control group. Hight and weight were measured and clinical signs of anaemia were recorded. Feeding trial 100 gm of chakli by incorporating dehydrated onion stalk providing 14 mg iron / 100gm of product for 30 days.control group was not given any

suplimentation.The result showed the mean haemoglobin levels of experimental group before intervention was 8.20±0.21 girls and in control group the value obtains was 7.58 ± 0.19 g/dl.After 30 days of feeding experiment , a significant improvement (P≤ 0.01) in the haemoglobin level 8.58±0.26 g/dl) was observed.whereas the change in the control group was found non significant(7.67 ± 0.21 g/dl).Hence supplementation of dehydrated onion stalk bases Chakli can significantly improve the nutritional and haemoglobin status of adolescent girla.

Aspuru, **K., Carlos Villa., Bermejo ,F., Herrero**, **P., et al. (2011)** The daily requirements of iron are 1–3 mg/day; these requirements increase during the growth period, in women of childbearing age, and in pregnant women, and decrease due to the cessation of menses. Because gastrointestinal absorption of iron is limited, the diet must contain between 15 and 30 mg/day. The primary goal of dietary modification, that is, improving and maintaining the iron status of a population, involves changes in behaviour, leading to an increase in the selection of iron-containing foods and a meal pattern that favours increased bioavailability. Efforts should be focused on promoting the access to iron-rich foods (eg, meat and organs from cattle, fowl, fish, and poultry, and non-animal foods such as legumes and green leafy vegetables) and foods that enhance iron absorption (some fruits, vegetables, and tubers).

Neeba Aniyan . (2011) A pre experimental study was conducted to assess the effectiveness of Nutritional intervention on Anaemia among adolescent girls with iron deficiency anaemia in Nachiyampalayam at Dharapuram, Tamil Nadu. A sample of 50 adolescent girls. The samples that had less than 11gm of Haemoglobin. On the first two days demographic variables were collected and the level of anaemia was assessed by checking the haemoglobin using Sahli's hemometre, and signs and symptoms was assessed by structured observational checklist. Samples were visited every day in their

homes and made to consume nutritional balls and one guava. After 30days the study result shows that in before nutritional intervention among 50 adolescent girls with iron deficiency anaemia depicts that 8(16%) had mild levels of anaemia, 33(66%) had moderate levels of anaemia and 9(18%) had severe levels of anaemia. In the after nutritional intervention 29(58%) had mild levels of anaemia and 21(42%) had moderate levels of anaemia. the mean scores of pre test and post test level of anaemia among adolescent girls 14.828 (SD + 1.16) and 13.54 (SD + 0.55) respectively. Thus the difference in pretest and post-test mean was 1.29. The overall pre-test mean percentage was 29.656, where as the post test mean percentage was 27.08. Post test level of anaemia mean score is less than the pre test score. Paired 't' value is 8.94 which was significant at 0.05 level. The mean and standard deviation findings showed that the nutritional intervention was effective in increasing the haemoglobin level among adolescent girls with iron deficiency anaemia.

Institute of Health Management Pachod, Pune. (2009) A recent study was carried out on 1142 adolescent girls residing in 16 slums of Pune from 2006-2009. The main objective was to increase the number of daily meals adolescent girls eat from 2 meals to 3-4 meals, and to encourage girls to consume iron rich foods on a daily basis. Weekly iron and folic acid tablets were given in the first 3 months; ongoing nutrition education through home visits and meetings was done by community health workers, participatory activities were undertaken such as food fairs, community projects were undertaken through life skills programme; audiovisual materials such as flash cards and posters were developed by the adolescent participants. Blood samples were collected at baseline and end of the study, and haemoglobin was estimated. Findings showed that anaemia is significantly more likely among girls who eat two or fewer meals in a day, have been sick in the past

year, and consume few iron rich foods. It was also found that intervention has influenced dietary behaviour with a significant increase in the intervention site compared to the control site in the percentage of girls who eat more than 3 meals a day, eat lemon with their meals, as well as in the frequency of eating fruits. Blood testing showed that mean Hb levels increased from 5.8 to 9.5 gm/ dl for severely anaemic 3girls, and from 8.9 to 11.2 gm/ dl for moderately anaemic girls. It was suggested that Government's Anaemia Prevention and Control Programme should focus on adolescents. Participatory nutrition education can influence adolescent girls' anaemia status and dietary behaviour.

Nimalai singh., Reshma boolchandani., Kanika varma., Divya Bang., Beena Mathur., Shubha Dube. (20009) The experimental study was conducted on 25 adolescent girls (13- 18 years) in an orphanage of Jaipur city. Out of 25 girls 12 comprised of experimental group and 13 were control. Experimental girls were given 15 gm Leaf concentration every alternate days for a period of 30 days .Nutritional status of subjects was asssesd using anthropometry, dietary, clinical assessment and haemoglobin estimation. Resule showed that the haemoglobin levels were estimated at baseline, mid – intervention, and after intervention. After supplementation period of 3 months significant increase in haemoglobin levels were observed.

Rani, V., Brouwer, Inge., Khetarpaul, N., Zimmerman, M.B. (2009) A randomized controlled study was conducted to find out the efficacy of a Local Vitamin-C Rich Fruit in Improving Iron Absorption from Mungbean Based Meals and its effect on Iron Status of Rural Indian Children (10-16 Years) 300 samples at school of Mangali village situated in Hisar district of Haryana state in a school feeding program for seven months. Main study parameters/endpoints: Primary outcome will be the measurement of body iron stores (mg/kg of body weight) based

on the ratio of serum transferrin receptor to serum ferritin. Three weeks before the trial available children in selected schools will be screened for eligibility of the study on the basis of medical health questionnaire. Deworming will be done at least 20 days before the start the feeding trial with a single dose of Albendazole (400 mg), that will be given again after three months. These 300 children will be assigned to three groups (100 children each group). Group-1 will be served with the normal school feeding program (SFP) meal and this group will also serve as control group for the study. Group-2 will be served with mungbean test meal and group-3 will be served with guava fruit in addition of mungbean test meal. Meals to all children will be provided for six days in a week up to seven months. All meals will be served at mid morning (11.00 am to 11.30 am). Effect of intervention will be assessed in terms of iron status of children. After supplementation period of 7 months significant increase in haemoglobin levels were observed in experimental group 3.

Sood, (2008). A randomized controlled study was conducted to assess the effectiveness of nutrition intervention Among the 84 adolescent girls in rural India, majority 24(29%) adolescent girls had increase in haemoglobin level in the range of 1.0gm/dl-1.5gm/dl, the increase in haemoglobin level was 3.7gm/dl for only one (1.2%) girl. There was no increase in haemoglobin level for 6(7.1%) girls. Comparison of Haemoglobin Level before and after Administration of Ragi nutrition ball through Paired "t" Test: The calculated value of t is 14.22, which is more than the tabulated value a $p<0.001$ level. This shows that there is a significant difference in haemoglobin level before and after administration of ragi nutrition ball. A ragi nutrition ball was a supplement food developed using locally available foods like jaggery, processed ragi flakes, cress seeds, and amaranth seeds in school going children belonging to low income families. The, children were given one ladoo per

day for a period of 30 days. Effect of supplement on haemoglobin levels, height and weight were assessed. Significant increase in haemoglobin levels was observed in both the boys and girls after 30 days of supplementation only. In majority of the subjects, progression from one haemoglobin levels to the next higher level was observed.

Dr. Jaya Mohanraj et.al., (2008) A simple random experimental study was conducted a study to assess the effectiveness of nutritional intervention among women with anaemia in Thiruvallur District total of 60 anemic adolescent girls aged 15-20 years. In which 30 anaemia adolescent girls has control group. In pretest haemoglobin level was assessed. Interventions include deworming, nutritional (iron rich) balls with vitamin "c' rich food (guva) was administered for 30 days . The nutritional balls weighing 50 gms made up of Cowpea, Amaranth tristis, Roasted Bengal gram, Bajara, Gingly seeds and Jaggery. This ball gives 5.79 mg of iron and 100 gms of fresh guva contain 212 mgs of ascorbic acid . In post test the effect of nutritional intervention on the improvement of haemoglobin level was assessed among the women with anaemia . Independent student "t" test was used to find out the effectiveness of nutritional intervention. The result showed that there was a reduction in the percentage level of 7-9 gms/dl in women from 30% to 3.3% and 60% to 86.7% in the range between 9-11 gms/dl in experimental group.

Deshmukh,P.R.et.al., (2008) A study was conducted to evaluate the effectiveness of a weekly regimen among slum and tribal of Nasik district, Maharashtra, India.The study was conducted to reveal the improvement of consuming vitamin C foods to improve the haemoglobin levels. The participants from Baroda city were given a mixed diet in a hotel with vitamin C rich guava, citrus fruits, lemon

juice. At the end of nine months interventional trail, there was a very significant rise in haemoglobin levels of the study participants.

Beena Mathur., Shubha Dube. (20008) A cross-sectional study was conducted with amaranth and spinach to find out the iron availability by a nutritional supplement preparation in Jaipur city. The ratio of amaranth, spinach, jaggery and Bengal gram in the supplement was 2:2:3:2. They also tested its iron availability after blanching and cooking. The results revealed that an increase in the haemoglobin, serum ferritin levels and there was a significant reduction in the oxalic acid and phytic acid contents.

Dhage, **V.R.(2008)** A cross-sectional survey was conducted to improve the haemoglobin levels of adolescent girls to determine the nutritional quality of nutritional supplement a wheat based soft cowpea pasta. The study was done in north east Brazil where cowpea is a staple food. The results revealed a significant increase in the haemoglobin levels.

Sanjeeve M. Chaudhary., Vasant R. Dhage. (2008). A study was conducted to evaluate the effectiveness of influence of iron status an urban area Nagpur. A total of 296 adolescent girls (10-19 years) were included in this study. The group was divided into two groups of 10 subjects with iron deficiency anaemia. In study 1, the meal was fed alone with 1 or 2 cups of black tea. In study 2 the meal was fed alone with ascorbic acid. Results showed that iron absorption from rice meal was approximately 2.5 times greater as compared with the consumption of tea. The consumption of tea decreased iron absorption. The result showed that there was significant rise in the mean haemoglobin levels for that weekly supplementation of

iron to adolescent girls. So it should be universally started to correct iron deficiency among the adolescent girls.

Ruchika Hanta., Faizan Ahammed. (2008) The study was to investigate nutritional status of 10-18 years school going children. A total of 150 school going children were selected from four different schools of Allahabad district, India. Data on dietary intake was collected by using 3 days dietary recall method. Heights, weights and Mid Upper Arm Circumference were measured. Haemoglobin levels of children were estimated by cyanmethaemoglobin method. Clinical status assessing anaemia was also recorded. Consumption of all the nutrients by majority of the students was comparatively less than the recommended dietary allowances. Data on anthropometry revealed that out of total children screened (N=150), mean height and weight in all the age group was significantly ($p<0.05\%$) less than the National Centre for Health Statistics standards. Haemoglobin test revealed that 65.33% had haemoglobin level below the normal (12 g dlG) values, indicating anaemia, out 1 of which approximately half (53.33%) were mild anemic and 12% were moderate anemic. It is concluded that poor anthropometric indices, under nutrition and iron deficiency anaemia may be due to lower intake of food and nutrients than recommended.

CONCEPTUAL FRAMEWORK

Tabot (1995) states that a conceptual framework is a net work of interrelated changes that provide a structured for organizing and describinga phenomenon of interest. Research studies are based on the theoretical framework that facilitates visualizing the problem and places the variables in a logical context.

A conceptual or a model up of concepts which are the mental images of the phenomenon. This concept are linked together to express the relationship between them..A model is used to denote symbolic representation of concepts..One of the important purposes of the conceptual framework is to communicate clearly the interrelationship of various concepts. It guides an investigator to know what data needs to be collected and give direction to the entire research process (Kerlinger K.N, 1993).

The conceptual framework of the present study was based on Abdellah's typology of nursing problems. According to Abdellah, nursing is a comprehensive service that combines art and science. It does something for a client or provides information that helps to meet the client's needs ,increases or restores self – help ability or alleviates impairment. It also includes or uses the nursing process through a problem solving approach and can use the nursing problems. under three categories physical, social and emotional needs of a client, interpersonal relationship between a nurse and a client and common elements of client care.

Health Care Need

The major component of Abdellah's typology is a list of nursing problem or health care needs of the client. Abdellah's describes 21 nursing problems under three categories; physical, social and emotional needs of a client , interpersonal relationships between a nurse and a client and common elements of client care. In this present study the nurse researcher assess the demographic charctertics such as age, religion ,education , family income, type of family , Type of diet, Any treatment for anaemia ,Duration of menstrual days, Duration of menstrual cycle, Menstrual flow, Serve coffee/tea per day, Taking deworming treatment, Undergone any surgery and assessment for the symptoms of anaemia with observation checklist and clinical estimation of haemoglobin level by Sahli's Haemoglobin method and identifies the health care needs of the adolescent girls.

Problem solving approach

According to Abdellah , a nurse be able to solve problems to render the best professional nursing care. The analyzer identifies the problems and selects an appropriate course of action to solve these problems. According to her , a nurse must be able to solve problems to render the best professional nursing care. In this present study, it is the intervention part which includes nutritional intervention. Nutritional intervention was given for 30 days for adolescent girls with iron deficiency anaemia . Intervention includes ragi flour 50gms, roasted Bengal grams 50grm, Seasame seeds 50grams, jaggery 100grms form of ball and amla 10 grams.

Health Care Need Met

Health care need met includes after intervention, increased haemoglobin level among adolescent girls or not increased haemoglobin level will be seen among adolescent girls.

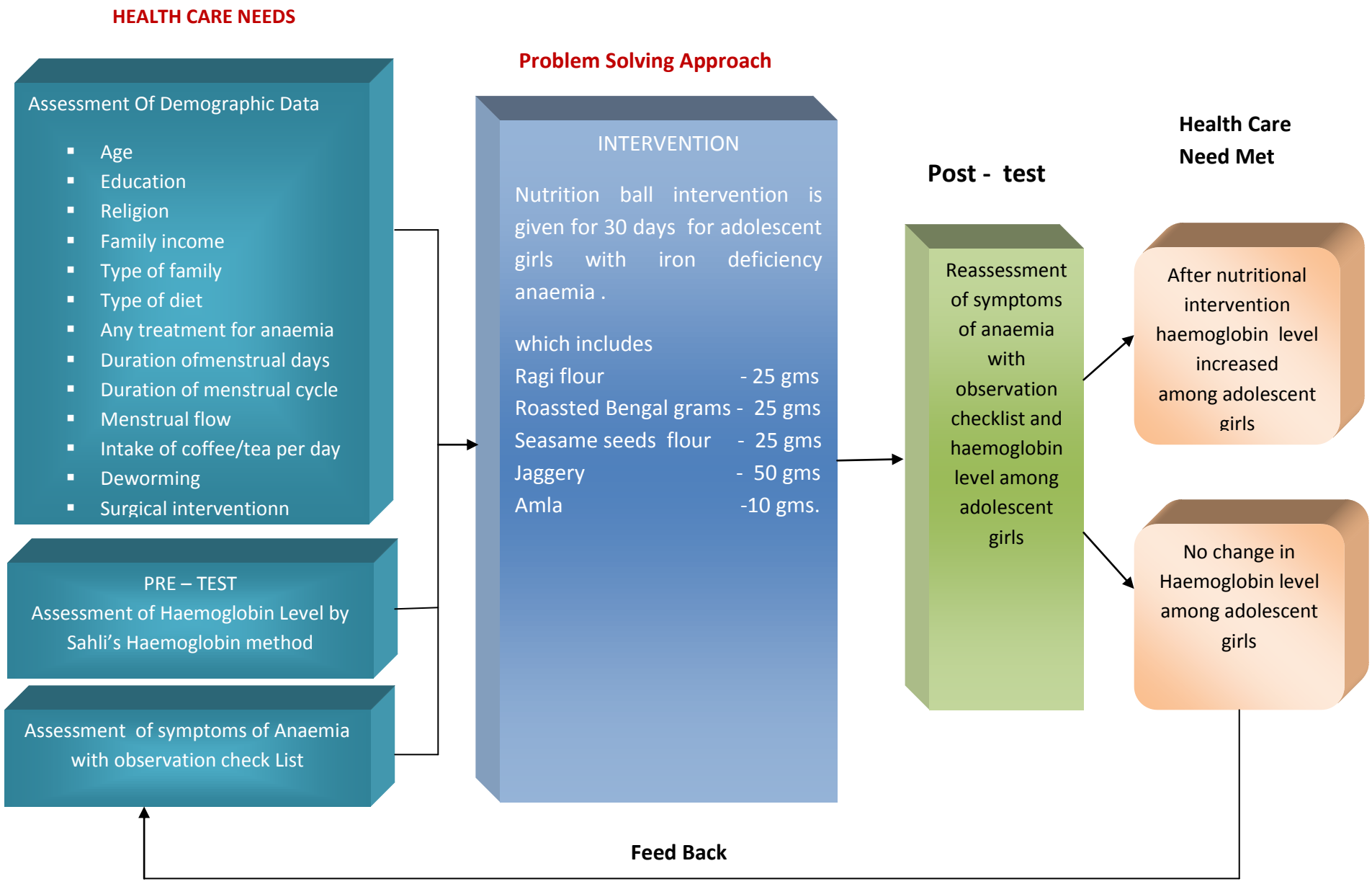


Figure 1 : Conceptual Framework based on Modified Abdellah's Typology of Nursing Problems (1960)

CHAPTER- III

RESEARCH METHODOLOGY

This chapter deals with description of the methods and different steps used for collecting and organizing data for the investigation. It includes the description of the research approaches, research design, setting, population, the sample, sampling technique, sampling criteria, the development and description of tool, the pilot study, data collection procedure, and the plan for the data analysis in the study. This present study was done to assess the Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.

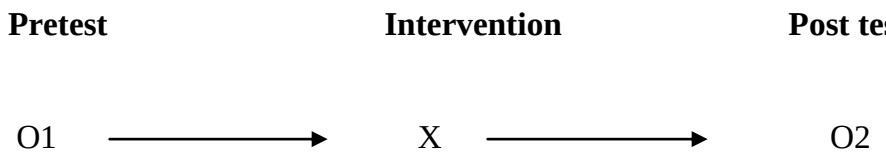
3.1 RESEARCH APPROACH:

Quantitative research approach was used in this study.

3.2 RESEARCH DESIGN

The research design selected for this study is Pre experimental one group pre-test and post test design.

According to Polit and Hungler (2006) the schematic representation is shown below



3.3 RESEARCH VARIABLES

Variables are character that can have more than one value, the three categories of variables discussed in the present study were

Independent variable:

Nutrition ball **.**

Dependent variable:

Haemoglobin level.

Baseline variable:

Age, religion, education, family Income, type of family , type of diet, Previous treatment for anaemia, duration of menstrual days, duration of menstrual cycle, Menstrual flow, drink tea/coffee /day, wear chapels regularly, taking deworming treatment, undergone any surgery.

3.4 SETTING OF THE STUDY

The setting was selected based on acquaintance of the investigator with the institution, feasibility of conducting the study, availability of the sample, permission and proximity of the setting to investigation.

The study was conducted in GCHL industry (unit- sree Meenakshi mills) Paravai unit hostel at Madurai. This hotel is inside the GCHL industry campus. The hostel rooms are adequately spacious and well ventilated. Regarding food pattern, all of them have

non- vegetarian diet and weekly once a non vegetarian diet and one egg was provided weekly twice . Remaining days they were provided vegetarian diet with snacks in the evening like biscuits, mixture etc.

3.5 POPULATION

TARGET POPULATION

The target population in this study was all adolescent girls with iron deficiency anaemia .

ACCESSIBLE POPULATION

Adolescent girls with iron deficiency anaemia working and staying in hostel at GHCL industry in Madurai were the accessible population.

3.6 SAMPLE

Samples are adolescent girls with iron deficiency anaemia who were working and staying in GHCL industry in Madurai those who have fulfilled the inclusion criteria.

3.7 SAMPLE SIZE

The total sample size was 60 adolescent girls.

3.8 SAMPLING TECHNIQUE:

Non probability Purposive sampling technique was used to select the sample for the study.

3.9 CRITERIA FOR SAMPLE SELECTION

The study samples were selected by the following inclusion and exclusion criteria

Inclusion criteria

- Adolescent girls between the age group 17 -19 years
- Adolescents girls with haemoglobin level between 9gms % - 11.9 gms%.
- Who were willing to participate.

Exclusion criteria

- Who were taking iron supplement.
- Those who were on medical treatment.
- Those who were having irregular menstrual cycle.

3.10 DEVELOPMENT OF TOOL

After extensive review of literature and discussion with the experts and with the researcher's personal and professional experience a structured self administered questionnaire were used to collect the demographic data of adolescent girls.

3.11 DESCRIPTION OF TOOL

The tool for data collection consists of 3 parts namely

PART I

Consists of demographic variables of adolescent girls (age, education, religion, family income, type of family, type of diet, previous treatment for anaemia, duration of menstrual cycle, days and flow, drink tea/coffee per day, wear chaples and undergone any surgery).

PART II

Clinical assessment of symptoms of anaemia with observation checklist used to assess the symptoms of anaemia among adolescent girls.

PART III

Clinical assessment of haemoglobin level estimation among adolescent girls before and after nutrition ball intervention (Sahli's method of haemoglobin testing).

SCORING PROCEDURE AND SCORING KEY

Mild anaemia	- 10.1 to 11.9 gm%
Moderate anaemia	- 7 – 10 gm %
Sever anaemia	- < 7 gm % haemoglobin level

Nutrition Ball

It includes iron rich suppliment in the form of ball and Vitamin C.

- Ragi flakes 25gms - 1.35mg of iron
- Roasted Bengal Gram 25gms - 2.5 mg of iron
- Seasame seeds 25gms - 2.5 mg of iron
- Jaggery 50 gms - 5.7 mg of iron
- Amla (10gm) - Vitamin C 40mg

The nutrition balls were prepared by the investigator based upon review of literature and experts guidance. These balls give 13.5 mg of iron and 10gm of Amla containing 40 mg of ascorbic acid. The nutritive balls were prepared hygienically, the ingredients were cleaned, the seasame is fried and all ingredients are powdered and added with Jaggery powder and made into a ball.

VALIDITY AND RELIABILITY OF THE TOOL

3.12 Content Validity

The content validity of the self administered questionnaire has been checked and evaluated by 5 experts including 3 from the community health departments, one from director of Preventive and Social Medicine, and one from medical experts from department of Medicine, Madurai Medical College. Experts were requested to judge the items for the clarity, relevance, comprehensiveness and appropriate of the content. Appropriate modification was made in each part as per the suggestion given by the experts.

3.13 RELIABILITY

The tool was administered to 10 samples representing the characteristic of the population. The reliability coefficient was calculated through inter-related method. The co-relation co-efficient on 0.971. The tool was found to be highly reliable.

3.14 EHICAL CONSIDERATION

The research proposal was approved by the experts of the Dissertation Committee of College of Nursing, Madurai Medical College, Madurai, and the same was approved by Institutional Review Board, Independent Ethical Committee of Government, Rajaji Hospital, Madurai-20 for conducting the pilot study and main study. The formal permission was obtained from DDHS , Madurai. The committee suggested the researcher to continue study with slight modification.

3.15 PILOT STUDY

The pilot study was conducted in Paravai GCHL industry in Madurai with 10 adolescent girls working and staying in industry hostel was selected as a sample after obtaining a informed consent. The purpose was to find out the feasibility of the study. The questionnaire was found to be feasible and result showed that they were appropriate and feasible.

3.16 PROCEDURE FOR DATA COLLECTION

The data collection procedure was done for 4 weeks in selected industry hostel at Madurai. The data was collected in all days including Sundays. Permission to conduct the study was obtained from the manager and the hostel warden. The samples were informed by the researcher about the nature and purpose of the study. After obtaining their written consent , the demographic variables have been collected with use of self administered questionnaire and assessment were done for symptoms of anaemia with observation checklist and pretest including estimation of haemoglobin level among adolescent girls were tested by Sahli's haemoglobin method. On the first day night deworming done by

T.Albendazole 400mg per sample was given. Next day onwards the nutrition ball was given to the samples 2 times per day for 30 days. The intervention was administered to the adolescent girls in the equally divided portion. After that on 31st day the post test was done by assessment of haemoglobin estimation by Shali's haemoglobin method.

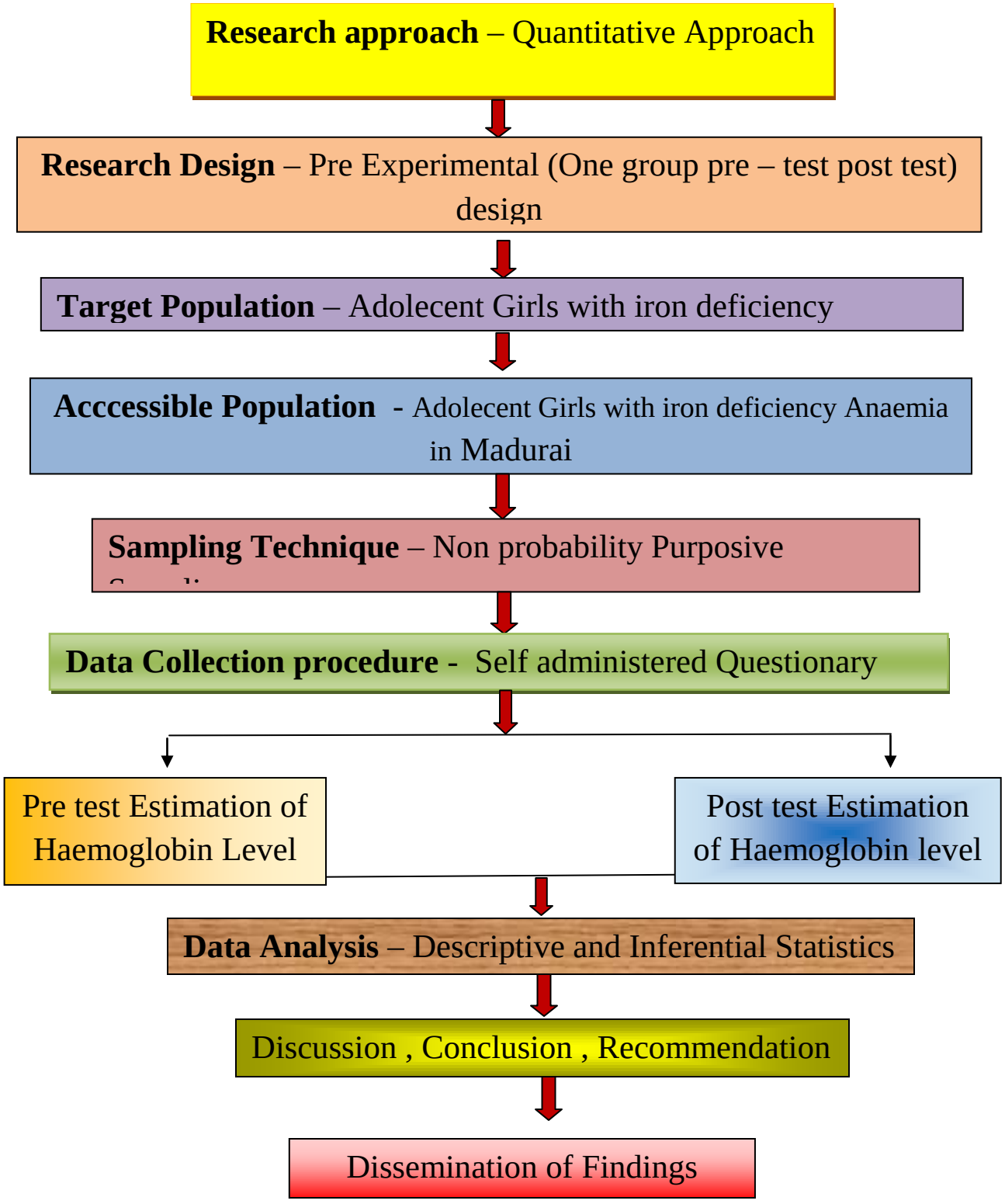
3.17 PLAN FOR DATA ANALYSIS

The demographic variables were analyzed by using descriptive measures (frequency and percentage). The haemoglobin level were analyzed by using descriptive measures (mean and standard deviation). The effectiveness of nutrition ball was analyzed by using paired't' test. The association between haemoglobin level with their selected demographic variables among adolescent girls were analyzed by using inferential statistics (chi-square).

3.18 PROTECTION OF HUMAN SUBJECTS

The investigator obtained approval from dissertation committee, The Government Rajaji hospital ethical committee, and formal written permission from the DDHS and manager of the GCHL industry. Each individual client was informed about the purpose of the study and confidentiality was promised and ensured. Both verbal and written consent was obtained from all the study subjects and data collected was kept confidential. The names of the subjects were not disclosed in any form. The client had freedom to leave the study at her will without assigning any reason. Anonymity was maintained throughout the study.

FIGURE 2: SCHEMATIC REPRESENTATION OF RESEARCH STUDY



CHAPTER – IV

DATA ANALYSIS & INTERPRETATION

This chapter deals with the analysis and interpretation of the data collected from 60 Adolescent girls with anaemia in order to assess the effectiveness of nutrition ball on anaemia. The purpose of analysis was to reduce the collected data to manageable and interpretable form, so that the research problem can be studied and tested.

According to Polit and Hungler (2005) analysis is the method of organizing, sorting and scrutinizing data in such a way that research questions can be answered. The analysis and interpretation of data of this study is based on the data collected through assessment of symptoms for anaemia with observation checklist and haemoglobin estimation among adolescent girls. The results are computed by using descriptive (mean, frequency percentage distribution and standard deviation) and inferential statistics.The study findings are presented in the section as follows.

Section I : Data on demographic variables of the adolescent girls.

Section II : Assessment of pretest haemoglobin level among adolescent girls

Section III : Assessment of posttest haemoglobin level among adolescent girls

Section IV : Evaluate the effectiveness of nutrition ball intervention among adolescent girls.

Section V : Association between posttest haemoglobin level with their selected Demographic variables.

SECTION I:

DATA ON DEMOGRAPHIC VARIABLES OF ADOLESCENT GIRLS

TABLE -I

FREQUENCY AND PERCENTAGE DISTRIBUTION OF ADOLESCENT GIRLS ACCORDING TO DEMOGRAPHIC VARIABLES

n = 60

S.NO	DEMOGRAPHIC VARIABLE	Frequency (f)	Percentage (%)
1.	Age in years		
	a) 17 - 18	27	45%
	b) 18 - 19	33	55%
	c) 19 – 20	0	0
2.	Education		
	a) Middle school	20	33.33%
	b) High school	26	43.33%
	c) Higher secondary school	6	10%
	d) Professional	8	13.33%
3.	Religion		
	a) Hindu	45	75%
	b) Muslim	2	3.33%
	c) Christian	13	21.67%
5.	Type of Family		
	a) Nuclear	45	75%
	b) Joint	15	25%

S.NO	DEMOGRAPHIC VARIABLE	Frequency (f)	Percentage (%)
6.	Type of Diet		
	a) Vegetarian	4	6.67%
	b) Non – vegetarian	56	93.33%
7.	Previous treatment for anaemia ?		
	a) Yes	0	0%
	b) No	60	100%
8.	Duration of menstrual days		
	a) 2 – 3 days	8	13.33%
	b) 4 – 5 days	19	31.67%
	c) > 5 days	37	61.67%
9.	Menstrual flow		
	a) Heavy	37	61.67%
	b) Moderate	18	30%
	c) Scanty	5	8.33%
10.	Duration of menstrual cycle		
	a) < than 28 days	8	13.33%
	b) 28 days	21	35%
	c) 30 days	25	41.67%
	d) > than 30 days	6	10%
11.	How many times drink tea/coffee per day		
	a) Once a day		
	b) Twice a day	6	10%
	c) More than twice a day	44	73.33%
		10	16.67%
12.	Do you wear chapels regularly?		
	a) Yes	60	100%
	b) No	0	0

S.NO	DEMOGRAPHIC VARIABLE	Frequency (f)	Percentage (%)
13.	Have you taken deworming treatment?		
	a) Yes	0	0
	b) No	60	100%
14.	Have you undergone any surgery?		
	a) Yes	0	0
	b) No	60	100%

The above tables reveals,

Regarding age among 60 adolescent girls, 27(45%) of them were 18 years old and 33 (55%) of them belong to 19 years.

In the aspect of educational qualification , 20 (33.33%) of adolescent girls had the educational level up to middle school level, 26 (43.33%) were high school level, 6 (10%) were higher secondary level, and the remaining had 8 (13.33%) were professional education.

Regarding religion, most of the adolescent girls 45 (75%) Hindus, 2 (3.33%) Muslim, 13 (21.67%) Christian.

Based on the family income 24 (40%) of the sample have a family income of Rs. 3000-5000 and 33 (55%) adolescent girls have a family income of Rs. 5001- 10000 and 3 (5%) adolescent girls have their family income of more than **rs. 10001.**

With regard to the type of family, 45 (75%) girls come from the nuclear family and 15 (25 %) girls were from the joint family.

The variables of dietary pattern 56 (93.3%) Adolescent girls belong to the non vegetarian and 4(6.67%) of them are vegetarian. None of the adolescent girls 60 (100%) have taken any previous treatment for anaemia.

Regarding duration of menstrual days 8 (13.33%) girls were having 2 – 3 days and 19 (31.67%) girls were having 4 – 5 days and 37 (61.67%) girls were having more than 5 days .

With view of menstrual flow 37 (61.67%) girls were having mild menstrual flow and 18 (30%) girls were moderate menstrual flow and 5 (8.33%) girls were having sever menstrual flow.

Regarding menstrual cycle 8 (13.3%) girls had less than 28 days, 21 (35%) girls had 28 days, 25 (41.67%) girls had 30days and 6(10%) girls had more than 30days.

With regard to drink tea /coffee per day 6(10%) girls had once a day, 44 (73.3%) girls had twice a day and 10 (16.67%) girls had more than twice a day.

All 60 (100%) adolescent girls wear chapels regularly. None of the adolescent girls 60 (100%) have not taken deworming tablet and undergone surgery.

It is inferred that most of them belong to 18 and 19 years of age and most of them belonged to Hindu religion, most of their family income was Rs. 3000- 5000/- and many of them were from nuclear family . All are taking non vegetarian diet, none of them had taken previous treatment for anaemia and most of them having more than 5 days menstruation.

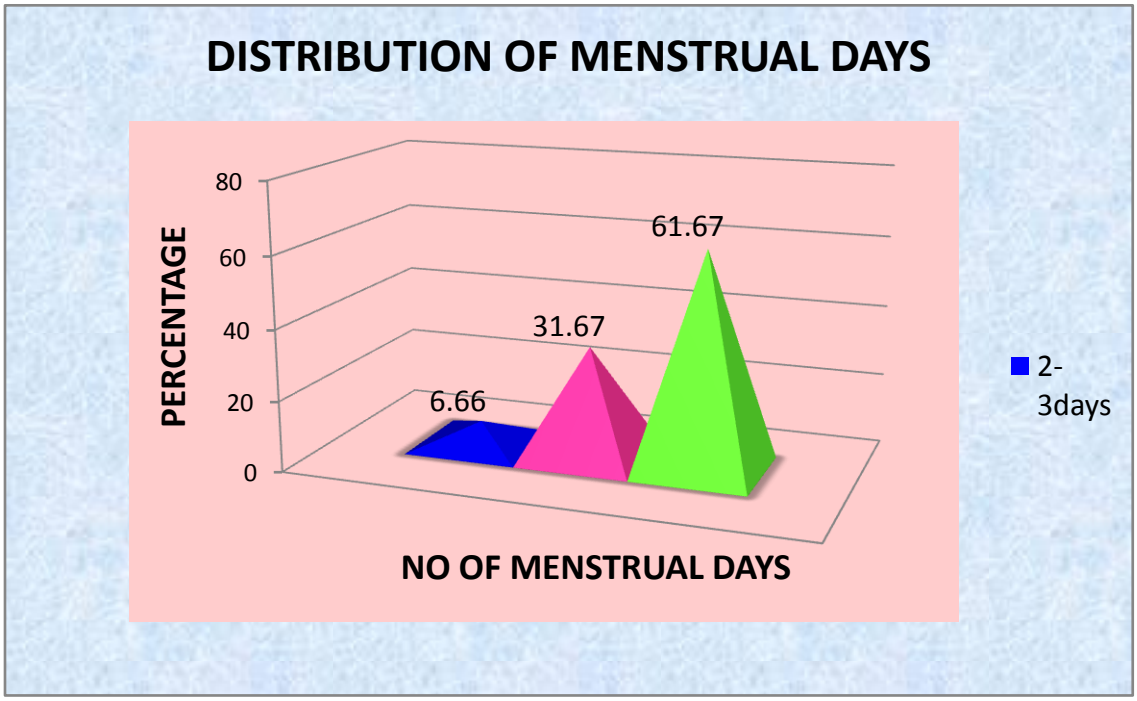


Figure 1 – percentage distribution of menstrual days for the Adolescent girls.

The above clustered cone diagram shows the majority of girls 61.7% in this study had more than 5 days and 31.67 % girls had 4-5 days of menstruation per month.

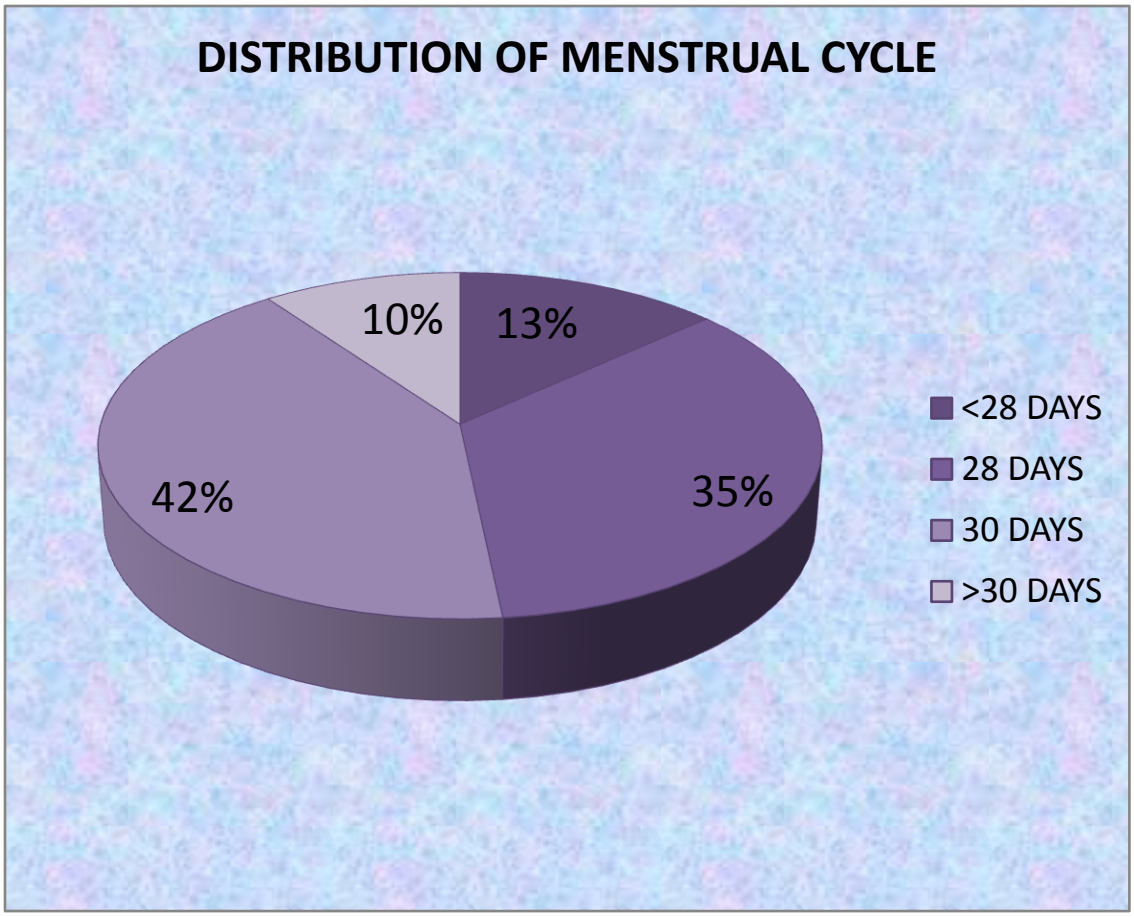


Figure 2 – percentage distribution of menstrual cycle for adolescent girls.

About pie r diagram 10% girls had more than 30 days, the majority of girls 42% had 30 days menstrual cycle.

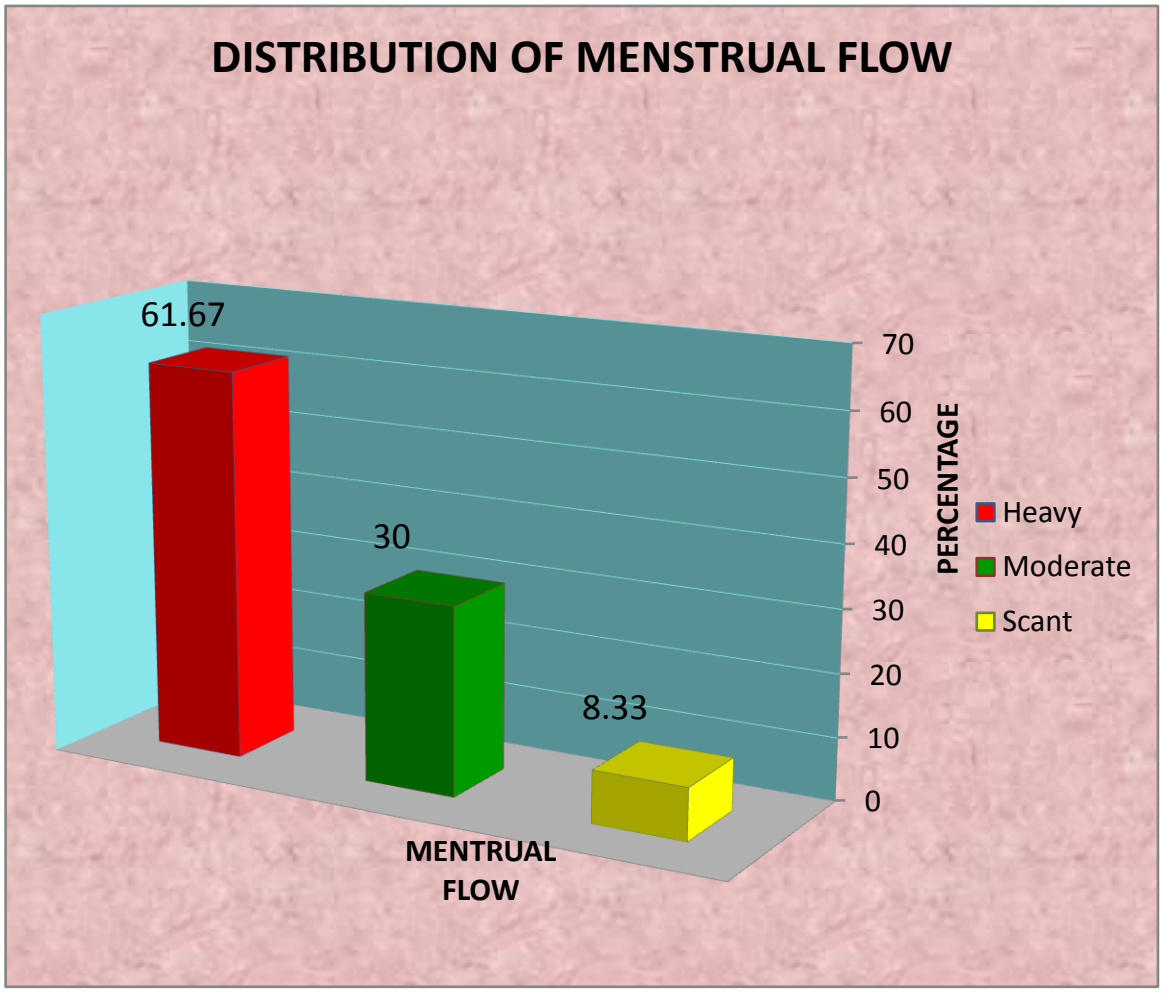


Figure 3 – percentage wise distribution of menstrual cycle of adolescent girls.

The above bar diagram of menstrual flow status, the highest percentage 61.67% of subjects had heavy menstrual flow and 30% had moderate menstrual flow.

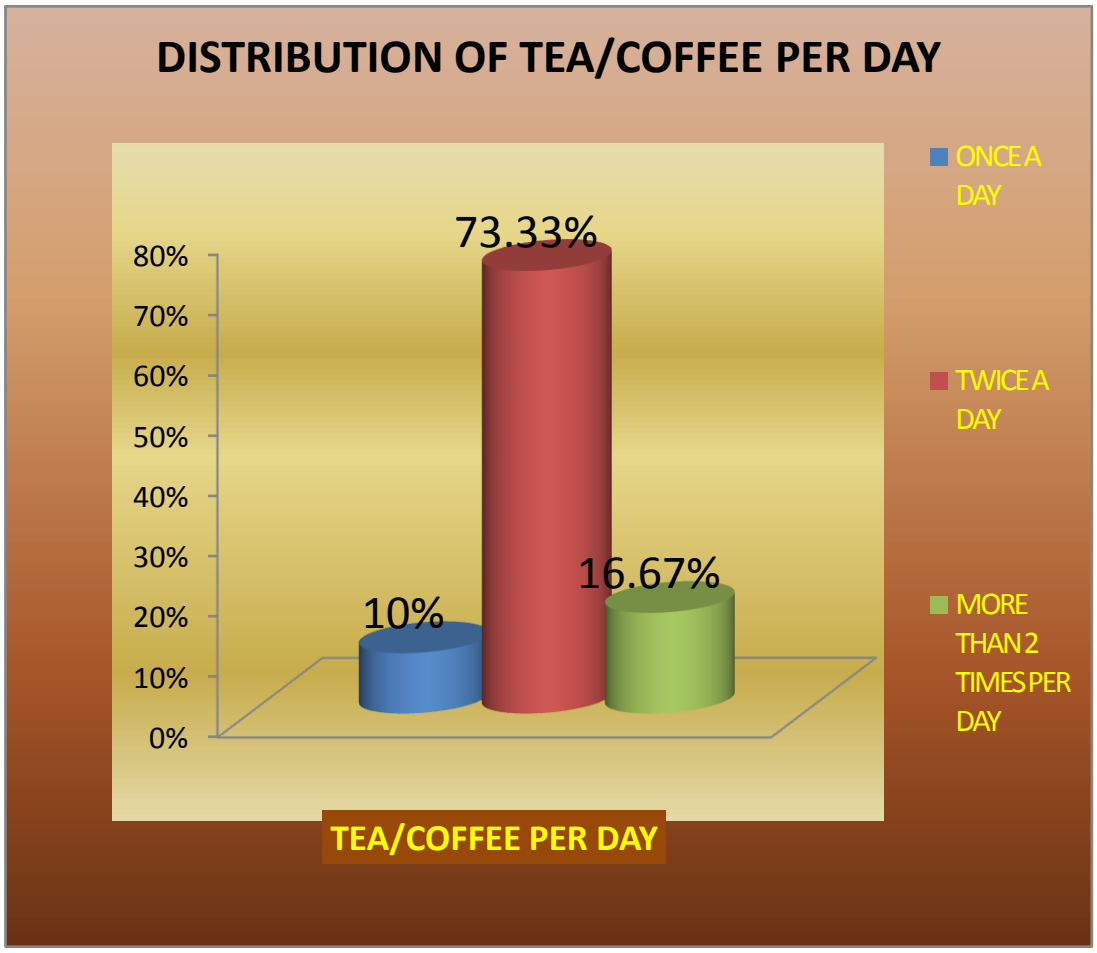


Figure 4 – percentage wise distribution of drink Tea/coffee per day of adolescent girls.

The Clustered cylinder diagram shows about 73.3% girls had drink tea/coffee twice a day and 16.6% girls had more than two times a day.

SECTION II

ASSESSMENT OF ANAEMIA AMONG ADOLESCENT GIRLS BEFORE NUTRITION BALL INTERVENTION

TABLE 2.1

Frequency and percentage distribution on symptoms of anaemia among adolescent girls before nutrition ball intervention

N= 60

S.No	Symptoms of Anaemia	N	%
1.	Paleness of conjunctiva	42	70%
2.	Pale tongue	50	83%
3.	Anorexia	32	53.3%
4.	Irritability	25	41%
5.	Fatigue	35	58.3%

The above table reveals higher percentage of adolescent girls 50 (83%) had paler tongue, 42 (70%) had paleness of conjunctiva,32 (53.3%) had the symptoms of anorexia, 35 (58.3%) had fatigue, remaining 25 (41%) had irritability.

TABLE 2.2

Frequency and Percentage of pretest haemoglobin level among Adolescent Girls

N = 60

S.No	Haemoglobin level among Adolescent Girls	N	%
1.	9	7	11.7%
2.	9.2	1	1.7%
3.	9.4	1	1.7%
4.	9.5	1	1.7%
5.	9.6	3	5.0%
6.	9.8	2	3.3%
7.	10	16	26.7%
8.	10.2	3	5.0%
9.	10.4	1	1.7%
10.	10.5	11	18.3%
11.	10.6	3	5.0%
12.	10.8	4	6.7%
13.	11	7	11.7%

The above table represents the haemoglobin level among adolescent girls before nutrition ball intervention. Among 60 adolescent girls, 7 (11.7%) girls were having 11 gm and 4 (6.7%) girls were having 10.8 gm haemoglobin level and 3(5%) girls belonged to 10.6 gm haemoglobin level. The 11 (18.3%) girls were having 10.5 gm haemoglobin level and 1 (1.7%) girl had 10.4gm haemoglobin level.

The 3(5%) girls were having 10.2gm haemoglobin level and 16 (26.7%) girls were having 10gm haemoglobin level. The 2 (3.3%) girls were having 9.8%gm haemoglobin level and 3 (5%) girls were having 9.6gm haemoglobin level. The 1 (1.7%) girls had 9.5gm haemoglobin level and 1 (1, 7%) girl had 9.4gm% haemoglobin level. The 1 (1.7%) girls had 9.2gm% haemoglobin level and 7 (11.7%) girls were having 9gm haemoglobin level.

It is inferred that 29 (48.33%) girls had mild anaemia and 31 (51.67) had moderate anaemia and none of them had severe anaemia before nutritional intervention.

SECTION – III

ASSESSMENT OF ANAEMIA AMONG ADOLESCENT GIRLS AFTER NUTRITIONAL INTERVENTION

TABLE – 3.1

Frequency and percentage on symptoms of anaemia among Adolescent Girls After Nutritional Intervention

S.No	Symptoms of Anaemia among adolescent girls	N	%
1.	Paleness of conjunctiva	10	16.7
2.	Pale tongue	12	20
3.	Anorexia	8	13.3
4.	Irritability	6	10
5.	Fatigue	9	15

After nutrition ball intervention 10 (16.7%) adolescent girls had paleness of conjunctiva and 12 (20%) girls had paler tongue. The 8 (13.3%) girls had Anorexia and 6 (10%) had irritability and remaining 9 (15%) girls had fatigue symptoms were not seen among adolescent girls after nutrition ball intervention.

It is inferred that major reduction on symptoms of anaemia among adolescent girls after nutritional intervention for 30 days.

TABLE – 3.2

Frequency and percentage distribution on post test Haemoglobin level among adolescent girls

S.No	Haemoglobin level among adolescent girls in gm%	N	%
1.	9.2	1	1.7
2.	9.4	1	1.7
3.	9.6	3	5
4.	9.8	5	8.3
5.	10	3	5
6.	10.2	1	1.7
7.	10.3	2	3.3
8.	10.4	12	20
9.	10.5	3	5
10.	10.6	3	5
11.	10.7	2	3.3
12.	10.8	6	10
13.	11	13	21.7
14.	11.2	2	3.3
15.	11.3	2	3.3
16.	11.4	1	1.7

The above table describes that after nutrition ball intervention majority of the adolescent girls 13 (21.7%) had haemoglobin level of 11 gm%. The haemoglobin level was increased for most of the adolescent girls when compared with the pretest scores.

SECTION IV

EFFECTIVENESS OF NUTRITION BALL AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANAEMIA

TABLE – 4.1

Comparison of pretest and posttest symptoms of Anaemia among Adolescent Girls.

S.No	Symptoms of Anaemia among Adolescent Girls	Number of adolescent girls		D
		Pre test	Posttest	
1.	Paleness of conjunctiva	42	10	32
2.	Pale tongue	50	12	38
3.	Anorexia	32	8	24
4.	Irritability	25	6	19
5.	Fatigue	35	9	26

Above table represents the effectiveness of nutritional intervention in reducing the symptoms of anaemia among adolescent girls. After 30 days of nutritional intervention paleness of conjunctiva was reduced from 42 (70%) to 10 (16.7%). Regarding the pale tongue it was reduced from 50 (83.3%) to 12 (20%) , anorexia was reduced from 32 (53.3%) to 8 (13.3%). Regarding the irritability it was reduced from 25 (41.7%) to 6 (10%) and fatigue symptom was reduced from 35 (58.3%) to 9 (15%) among adolescent girls after nutritional intervention. It is inferred that the symptoms of anaemia among adolescent girls were high during pretest and most of them had the reduction of symptoms of anaemia after nutritional intervention in post test.

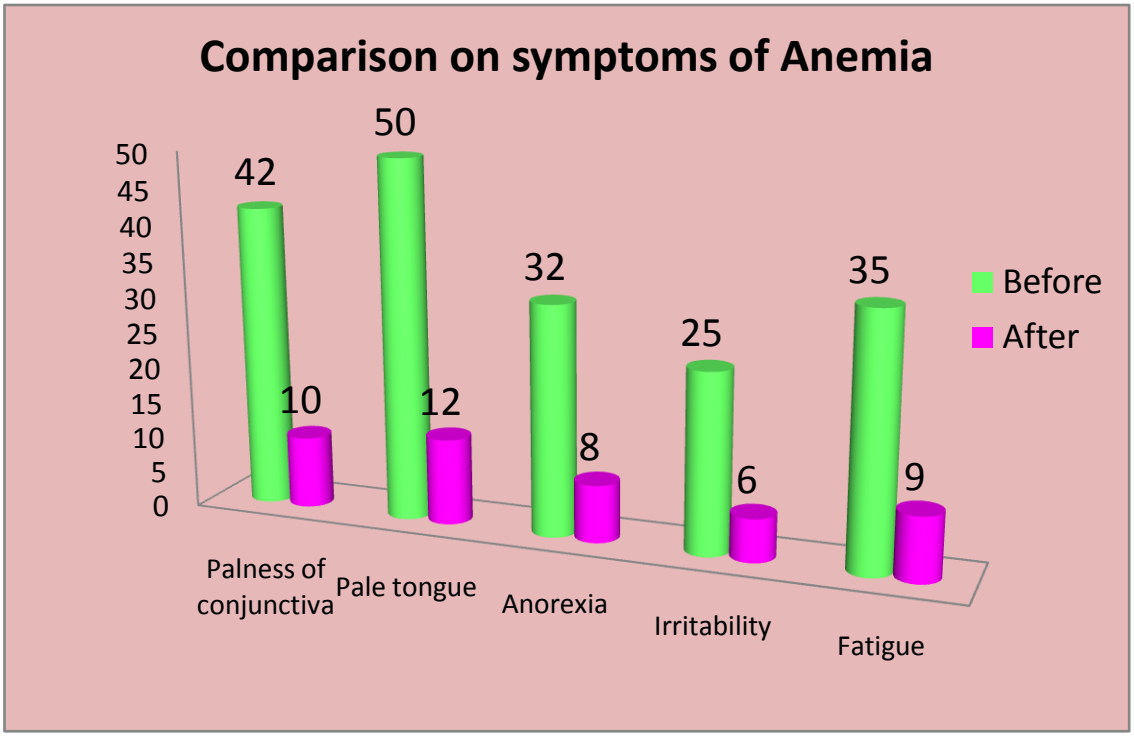


Figure 5 - percentage distribution of symptoms of anaemia before and after nutrition ball intervention.

Regarding the symptoms of anaemia was reduced after the nutrition ball intervention.

TABLE 4.2

Comparison of pre and post test Haemoglobin level among adolescent girls

TEST	**MILD**		**MODERATE**	
	F	%	F	%
Pre-test	29	48.3	31	51.67
Post test	47	78.3	13	21.67

The above table represents the effectiveness of nutrition ball intervention on improving the haemoglobin level among adolescent girls. In pre test most of the adolescent girls 31 (51.67%) had moderate anaemia and 29 (48.3%) of them had mild anaemia. Whereas in post test most of them had increased their haemoglobin level moderate anaemia was reduced to 13 (21.6%) and mild anaemia was increased 47 (78.3%).

It is inferred tha after nutrition ball intervention for 30 days moderate anaemia 31 (51.67%) has been reduced to 13 (21.67%) and mild anaemia from 29 (48.3%) improved to 47 (78.3%) .

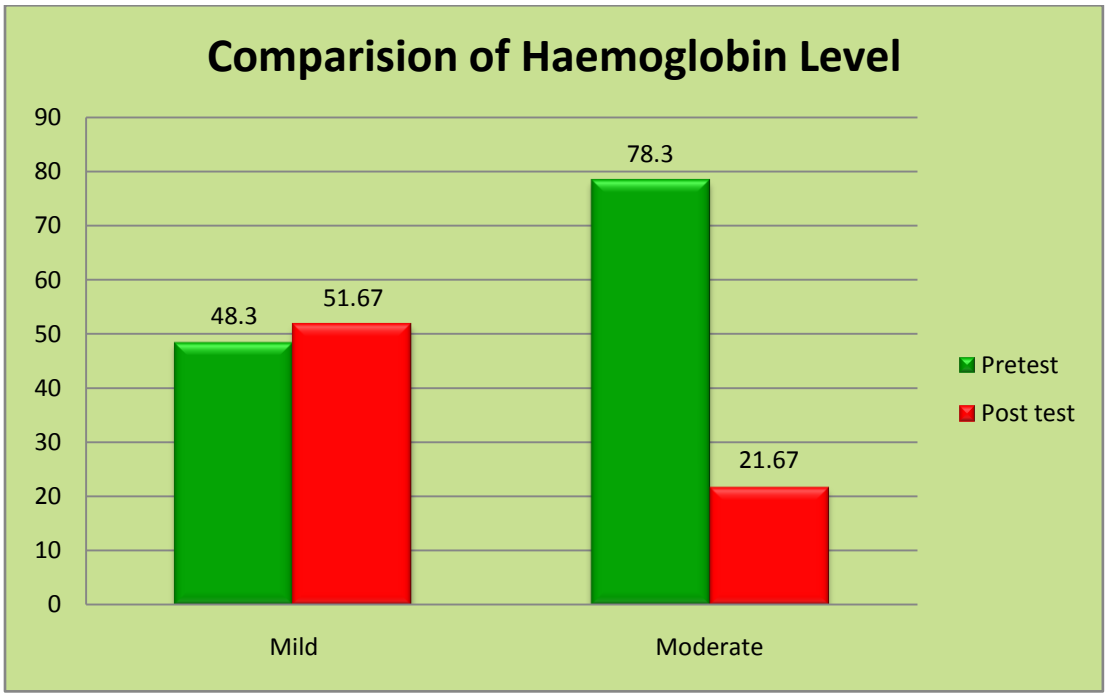


Figure 6 – Distribution of comparison of Haemoglobin Level in pre and post test level

The above diagram showed that 78.3% moderate anaemia reduced to 21.67% after nutrition ball intervention.

TABLE 4.3

Mean , Standard Deviation and 't' Value of pre-test and post-test Haemoglobin level

Test	Mean	SD	MD	't' value
Pre-test	10.13	0.6	0.38	**18.48 p-value<0.001 Significant**
Post-test	10.51	0.52		

Above table reveals that before intervention haemoglobin level among 60 subjects the pre test means was 10.13,SD about 0.6. After intervention haemoglobin among 60 subjects was 10.51, SD about 0.52 . The mean deviation in the haemoglobin between pre and post test was 0.38. The 't' value is(18.48) was much higher than the table value at 0.00l (pre set level of significant was 0.05). It means that there is a significant difference in the haemoglobin level after the nutrition ball intervention.

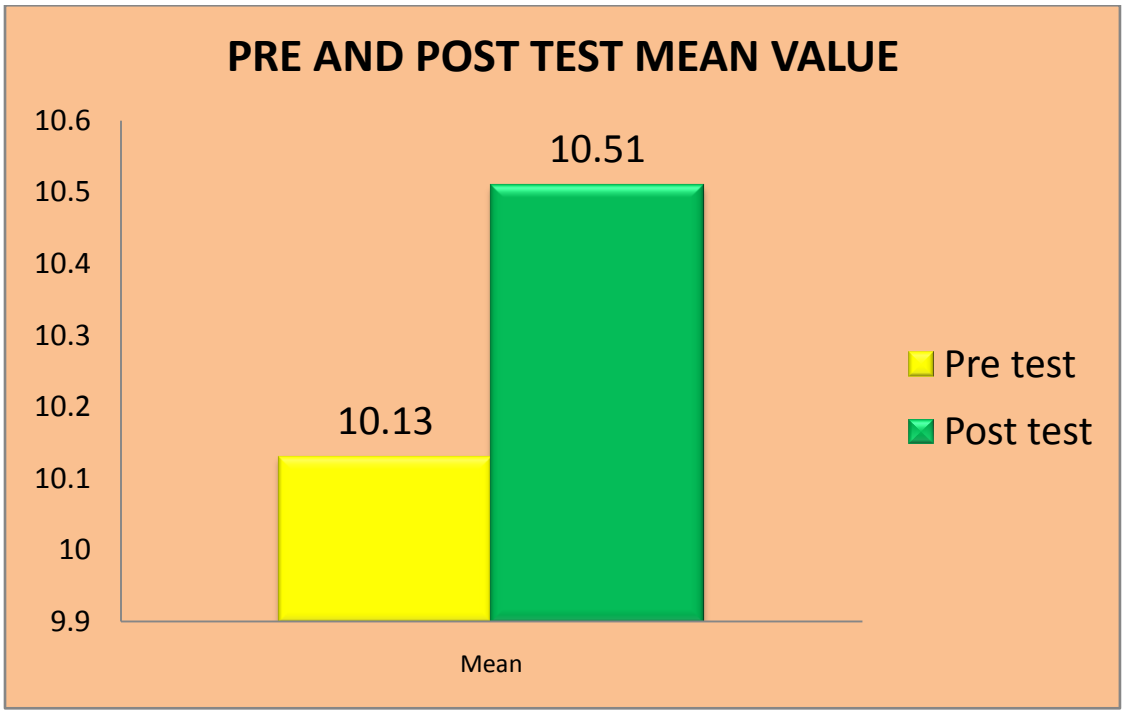


Figure 7 – Percentage distribution of mean value of pre test and post test haemoglobin level among adolescent girls.

The above bar diagram shows that the mean haemoglobin level of adolescent girls increased after the nutrition ball intervention.

SECTION V

ASSOCIATION BETWEEN POST TEST HAEMOGLOBIN LEVEL WITH THEIR SELECTED DEMOGRAPHIC VARIABLES.

TABLE: 5.1

Association between post test haemoglobin level and demographic Variables

S. NO	DEMOGRAPHIC VARIABLE	N		MILD		MODERATE		χ^2 value	P VALUE
		n	%	n	%	n	%		
1.	**Age in years**								
	a) 17 - 18	27	45	4	7	23	38		
	b) 18 – 19	33	55	9	15	24	40	1.25	P > 0.05 0.12 NS
	c) 19 – 20	0	0	0	0	0	0		
2.	**Education**								
	a) Middle school	20	33	2	3	18	30		
	b) High school	26	43	7	12	19	32		
	c) Higher secondary school	6	10	4	7	2	3	6.64	P > 0.05 0.18 NS
	d) Professional	8	13	0	0	8	13		
3.	**Religion**								
	a) Hindu	45	75	9	15	36	60		
	b) Muslim	2	3	0	0	2	3	1.12	P > 0.05 0.65 NS
	c) Christian	13	22	4	7	9	15		

S. NO	DEMOGRAPHIC VARIABLE	N		MILD		MODERATE		χ^2 value	P VALUE
		n	%	n	%	n	%		
4.	**Family Income** a) Rs.3000–5000	24	40	5	8	19	32	3.3	P > 0.05 0.73 NS
	b) Rs. 5001 – 10000	33	55	7	12	26	43		
	c) Rs. 10001 and above	3	5	1	2	2	3		
5.	**Type of Family** a) Nuclear	45	75	12	20	33	55	1.65	P > 0.05 0.79 NS
	b) Joint	15	25	1	2	14	23		
7.	**Previous treatment for anaemia ?** a) Yes	0	0	0	0	0	0	4.31	P > 0.05 0.18 NS
	b) No	60	100	13	22	47	78		
8.	**Duration of menstrual days** a) 2 – 3 days	8	13	1	2	7	12	10.54	**P < 0.05 0.005 Significant**
	b) 4 – 5 days	19	32	5	8	14	23		
	c) > 5 days	33	55	7	12	26	43		
	a) Moderate	21	35	5	8	16	27		
	b) Scanty	25	42	6	10	19	32		

S. NO	DEMOGRAPHIC VARIABLE	N		MILD		MODERATE		χ^2 value	P VALUE
		n	%	n	%	n	%		
10.	**Duration of menstrual cycle**							11.25	**P < 0.05 0.009 Significant**
	a) < than 28 days	6	10	1	2	5	8		
	b) 28 days	37	62	9	15	28	47		
	c) 30 days	18	30	4	7	14	23		
	d) > than 30 days	5	8	0	0	5	8		
11.	**Tea/coffee per day**							10.95	**P < 0.05 0.008 Significant**
	a) Once a day	6	10	0	0	6	10		
	b) Twice a day	44	73	10	17	34	57		
	c) More than twice a day	10	17	3	5	7	12		

NS – Non significant

The above table revealed that the calculated χ^2 value at 0.05 level of significance. There was significant association between the post test anaemia and the duration of menstrual days of adolescent girls. The calculated χ^2= 10.54 at P= 0.005 (P<0.05) level of significance. And there is significant association was found between the post test anaemia level and menstrual flow of adolescent girls. The obtained χ^2 = 13.8 at P= 0.008(P<0.05) level of significance. And also significant with duration of menstrual cycle of adolescent girls. Significant χ^2 = 11.25.at P= 0.009(P<0.05) level . There was significant association found between the tea/ coffee per day with post test anaemia level.

There was no significant association found in post test level of haemoglobin with the demographic variables like age, education, religion, family, income, type of family, previous treatment for anaemia.

CHAPTER - V

DISCUSSION

The aim of the present study was to evaluate the effectiveness of nutrition ball among adolescent girls in selected industry hostel at Madurai. The study was conducted by using p experimental (one group pretest and posttest) design. The adolescent girls who are working and staying in industry hostel at Madurai who have mild and moderate anaemia was selected for this study. The sample size was 60 adolescent girls who are staying in hostel. The self administered questionnaire was used to assess the demographic variables.

The data was analyzed through both descriptive statistics (mean, frequency percentage, and standard deviation) and inferential statistics (paired't' test and χ^2 test). Discussions on the study findings were arranged as follows.

BASE LINE VARIABLES OF PARTICIPANTS

Among 60 adolescent girls, 27 (45%) of them were 18 years old and 33(55%) them belong to 19 years old were taken for the study.

Regarding religion the sample comprises 45 (75%) Hindus, 13 (22%) Christian, and 2(3%) Muslims.

Majority of the adolescent girls education were 20 (33%) middle school, 26 (43%) high school, 6 (10%) higher secondary and 8 (14%) professional education.

The family income per month among 60 adolescent girls 24 (40%) of the samples income of. Below Rs 5000, 33 (55%) girls had a family income of Rs. 5001- 10000 and 3 (5%) girls had more than Rs. 10001and above as their family income.

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Regarding to the type of family, 45 (75%) girls came from the nuclear family and 15 (25%) girls were from the joint family.

Among 60 adolescent girls belong to the 56 (93%) non vegetarian dietary pattern and 4(7%) of them were vegetarian. All 60 (100%) Adolescent girls none of them were not taken treatment for anaemia.

Regarding menstrual days 8 (10%) girls had 2-3days, 19 930%) 4-5 days and 37 (60%) more than 5 days.

Regarding duration of menstrual cycle 8 (13%) girls were having less than 28 days duration , 21 (35%) girls were having 28 days duration ,25 (42%) 30 days duration and 6 (10%) girls were having more than 30 days duration.

Regarding menstrual flow 37 (62%) girls were having heavy menstrual flow, 18 (30%) girls were moderate menstrual flow and 5 (8%) girls were having scanty menstrual flow.

Regarding drink tea/coffee per day 6 (10%) girls were having once a day, 44 (73%) girls had twice a day and 10 917%) girls had more than two times per day.

All 60 (100%) adolescent girls wear chapels regularly. None of the adolescent girls 60 (100%) have not taken deworming tablet and undergone surgery

The present study was consistent with the age of adolescent girls the study was conducted by (**Sharda Sidhu et al., 2008).** A cross sectional survey was conducted in selected schools of rural area of Hassan district the age of the adolescent girls with anaemia varied between 12 years to 15 years. Only one (1.2%) girl was 12 years of age, 28 girls were 13 years of age, 51 (60.7%) girls were 14 years of age and four (4.8%) were 15 years of age. The present study revealed that the prevalence of anaemia increased with the age of adolescent girls the majority of girls 60.7% were 14 years of age and only 1.2% was 12 years of age. . Maximum level of severity of anaemia was seen to be present in age group 15+

The present study was consistent with religion the study was conducted by **(Manoranjan Pal et al., 2009)** an analytical study to assess the prevalence of anaemia among girls from households the Northeastern states. The Majority 74(88%) adolescent girls belonged to Hindu religion only 10 (12%) girls were Christians. The highest prevalence of anaemia among the Northeastern states was observed among girls from households with a low standard of living, non-Christian girls, girls from Scheduled Tribes. The highest percentages of girls with normal haemoglobin were reported among Christian Scheduled Tribes.

The present study was consistent with family income per month the study was conducted by (**Sabita Basu et al., 2008),** a cross sectional analytical study family' monthly income of a major proportion 43(51.2%) girls was less than 5,000, 7(8.3%) girls

had family income of more than 10,000 and 34(40.5%) girls had family income of 5,000-10,000. Studies reported prevalence of anaemia was lower in adolescent girls where the household income was more than Rs. 5000 per month and a higher prevalence where the household income was less than Rs. 5000 per month.

The present study was consistent with menstrual flow the study was conducted by **(Lloyd Van Winkle, 2009).** Descriptive study Among 84 girls, 79(94%) girls had regular flow of menstruation and 5(6%) girls had irregular menstrual flow, only 1(1.2%) girl had excess flow of menstruation her haemoglobin level was 10.2 gm/dl. Among girls, however, menstruation increases the risk for iron deficiency anaemia throughout their adolescent and childbearing years. An important risk factor for iron deficiency anaemia is heavier menstrual bleeding.

The present study was consistent with drink tea/coffee the study was conducted by **(Verma, A., 2008)** A cross sectional survey was conducted Majority 64(76.2%) girls had the habit of drinking coffee/tea, 39(46.4%) girls had habit of drinking once a day, 23(27.4%) had habit of drinking twice a day and 2(2.4%) girls had habit of drinking coffee/tea more than two times in a day and 20 (23.8%) girls had no habit of drinking coffee/tea. Anaemia was found to be higher among girls with the attributes of those with habit of post meal consumption of tea/coffee.

The present study was consistent with wear chapels regularly the study was conducted by (Stoltzfus et al., 2006). A study on epidemiology of iron deficiency

anaemia in Zanzibari schoolchildren reported that worm infestation has influence on anaemia largely .With regard to history of worm infestation, only five (6%) girls had done de-worming in the past, majority 79(94%) girls had not done de-worming in the past. 79(94%) girls used chapels while going to toilet, 5(6%) used no chapels while going to toilet. It was found that 25% of all anaemia, 35% of iron deficiency anaemia and 73% of severe anaemia was attributable to hookworm infection

The first objective of the study was to assess the haemoglibin level among adolescent girls at selected industry hostel in madurai.

Regarding the present study reveals that the haemoglobin level among adolescent girls before nutritional intervention 60 adolescent girls, 7 (11.7%) girls were having 11 gm% and 4 (6.7%) girls were having 10.8 gms% haemoglobin level and 3 (5%) girls belonged to 10.6 gm haemoglobin level. The 11 (18.3%) girls were having 10.5 gm% haemoglobin level and 1 (1.7%) girl had 10.4gm haemoglobin level.

The 3(5%) girls were having 10.2gm haemoglobin level and 16 (26.7%) girls were having 10gm haemoglobin level. The 2 (3.3%) girls were having 9.8%gm haemoglobin level and 3 (5%) girls were having 9.6gm haemoglobin level. The 1 (1.7%) girl had 9.5gm haemoglobin level and 1 (1,7%) girl had 9.4gm% haemoglobin level. The 1 (1.7%) girl had 9.2gm% haemoglobin level and 7 (11.7%) girls were having 9gm haemoglobin level.

It is inferred that 29 (48.33%) girls had mild anaemia and 31 (51.67) had moderate anaemia and none of them had severe anaemia before nutritional intervention.

The second objective of the study was to evaluate the effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.

Nutrition ball intervention was given to adolescent girls for 30 days to evaluate the effectiveness through post test haemoglobin level was 1(1.7%) girl had 9.2gm,1 (1.7%) girl had 9.4 gm, 3 (5%) girls had 9.6 gm , 5 (8.3%) girls had 9.8 gm, 3 (5%) girls had 10 gm, 1 (1.7%) girl had 10.2 gm, 2 (3.3%) girls had 10.3 gm, 12 (20 %) girls had 10.4%, 3 (5%) girls had 10.5 gm, 3 (5%) girls had 10.6 gm, 2 (3.3%) girls had 10.7 gm, 6 (10%) girls had 10.8 gm, 13 (21.7%) girls had 11 gm,2 (3.3%) girls had 11.2 gm, 2 (3.3%) girls had 11.3 gm,1 (1.7%) and girl had 11.4 gm haemoglobin level.

Regarding the reduction of symptoms of anaemia 60 adolescent girls after 30 days of nutrition ball intervention After 30 days of nutritional intervention 10 (16.7%) had paleness of conjunctiva and 12 (20%) girls had pale tongue. The 8 (13.3%) girls had Anorexia and 6 (10%) irritability and 9 (15%) girls had fatigue symptoms were not seen among adolescent girls after nutritional intervention.(Table 3.1).

It is inferred that major reduction on symptoms of anaemia among adolescent girls after nutritional intervention for 30 days.

The study concludes the nutrition ball intervention was very effective as evident from the following findings with respect of increased haemoglobin level. It also revealed that the post test mean score 10.51 was higher than the pre test mean score 10.13. The

mean deviation is 0.38 and obtained 't' value 18.48 was significant at P<0.05 level. Hence the stated hypothesis was supported. Thus there was significant difference between pre test and post test haemoglobin level among adolescent girls. It was inferred that the nutrition ball intervention increased the haemoglobin level and reduced the symptoms of anaemia among adolescent girls.

This study also consistent with study conducted by **Sood, 2008** to assess the effectiveness of nutrition ball intervention among adolescent girls, majority 24(29%) girls had increase in haemoglobin level in the range of 1.0gm/dl-1.5gm/dl, the increase in haemoglobin level was 3.7gm/dl for only one (1.2%) girl. There was no increase in haemoglobin level for 6(7.1%) girls. Comparison of Haemoglobin Level before and after Administration of Nutritional intervention through Paired "t" Test: The calculated value of t is 14.22, which is more than the tabulated value a p<0.001 level. This shows that there is a significant difference in haemoglobin level before and after administration of ragi ball. A study was conducted to test a supplement food developed using locally available foods like jaggery, processed rice flakes, cress seeds, and amaranth seeds in school going children belonging to low income families and include deworming. The, children were given one ladoo per day for a period of 30 days. Effect of supplement on haemoglobin levels, height and weight were assessed. Significant increase in haemoglobin levels was observed in both the boys and girls after 30 days of supplementation only. In majority of the subjects, progression from one haemoglobin levels to the next higher level was observed.

The present study shows that the nutrition ball intervention was effective on improving haemoglobin level among adolescent girls. Samples that had the symptoms of anaemia was reduced after 30 days of nutrition ball intervention. So the investigator suggest that all adolescent girls can take dietary iron supplementation.

Thus hypothesis I there is a significant difference between pre test and post test score of haemoglobin level was accepted.

The third objectives was to determine the association between the post test level of haemoglobin among adolescent girls with selected demographic variables.

The calculated χ^2 value at 0.05 level of significance. There was significant association between the post test haemoglobin and the duration of menstrual days of adolescent girls. The calculated $\chi^2 = 10.54$ at P= 0.005 (P<0.05) level of significant. And there is significant association was found between the post test haemoglobin level and menstrual flow of adolescent girls. The obtained $\chi^2= 13.8$ at P= 0.008(P<0.05) of significance. And also significant with duration of menstrual cycle of adolescent girls. Significance $\chi^2 = 11.25$.at P= 0.009(P<0.05). There was significant association found between the tea/ coffee per day with post test haemoglobin level.

The present study was consistent with menstrual flow with the study was conducted by **(Lloyd Van Winkle, 2009).** Descriptive study Among 84 girls, 79(94%) girls had regular flow of menstruation and 5(6%) girls had irregular menstrual flow, only 1(1.2%) girl had excess flow of menstruation her haemoglobin level was 10.2 gm/dl. Among girls, however, menstruation increases the risk for iron deficiency anaemia throughout their adolescent and childbearing years. An important risk factor for iron deficiency anaemia is heavier menstrual bleeding.

The present study was consistent with drink tea/ coffee the study was conducted by **(Verma, A., 2008)** A cross sectional survey was conducted Majority 64(76.2%) girls had the habit of drinking coffee/tea, 39(46.4%) girls had habit of drinking once a day, 23(27.4%) had habit of drinking twice a day and 2(2.4%) girls had habit of drinking coffee/tea more than two times in a day and 20 (23.8%) girls had no habit of drinking coffee/tea. Anaemia was found to be higher among girls with the attributes of those with habit of post meal consumption of tea/coffee.

Thus hypothesis ii there is a significant association between post test level of haemoglobin among adolescent girls with selected demographic variables was accepted.

CHAPTER - VI

SUMMARY RECOMMENDATION AND CONCLUSION

This chapter deals with summary, conclusion , limitation and recommendations of the study , further it includes implication for nursing practice , nursing education , nursing administration and recommendation for further nursing research.

6.1 SUMMARY

The aim of this study was to assess the effectiveness of nutrition ball among adolescent girls with iron deficiency anaemia in selected industry hostel in Madurai.

The Objectives of the study was

- To assess the haemoglobin level among adolescent girls at selected industry hostel in Madurai.
- To evaluate the effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.
- To determine the association between the post test level of haemoglobin among adolescent girls with selected demographic variables.

The following hypothesis was tested

H_1 There will be a significant difference between pre-test and post test score of haemoglobin level among adolescent girls with iron deficiency anaemia at selected industry hostel in Madurai.

H_2 There will be significant association between the post test level of haemoglobin among adolescent girls with selected demographic variables.

The review of literature enabled to develop conceptual frame work, tool and methodology for the studies. Literature review was done as follows, studies related to prevalence of iron deficiency anaemia among adolescent girls, studies related to factors and symptoms of iron deficiency anaemia, and studies related to changing dietary behaviours among adolescent girls.

The conceptual framework adopted was Abdullah's typology of nursing problems Pre experimental study design was used to explore the effectiveness of nutrition ball on improving haemoglobin level among adolescent girls with anaemia in selected industry at Madurai. The samples were selected by using non randomized purposive sampling technique the sample size was 60. The structured self administered questionnaire was used for data collection to assess the symptoms of anaemia, the observation check list was used and haemoglobin estimation done by sahli's haemoglobin method.

The instrument used to collect the data comprised of three sections.

Part I deals with demographic data

Part II consists of assessment of symptoms of anaemia with observation checklist

Part III consist of clinical estimation of haemoglobin level using Sahli's haemoglobin method and nutrition ball intervention for 30 days.

The content validity was checked by the experts in nursing and medical experts. Reliability was done by interrelated method. Data was collected for a period of 4 weeks among adolescent girls in selected industry at Madurai.

The methodology used for this study was quantitative approach. Pre experimental design – one group Pre test and Post test design . The adolescent girls who were working in industry and staying in hostel was selected for this study. The sample size was 60. Non Probability purposive sampling was used to collect the sample. The structured questionnaire was used to collect the demographic variables, symptoms of anaemia were assessed with observation checklist and estimation of haemoglobin level by using Sahli's haemoglobin method was used.

The data were analyzed through both descriptive statistics (Mean, frequency, percentage and standard deviation and inferential statistics (paired 't' test and chi- square) were used to test the study hypotheses. Discussion on the study findings were arranged as follows.

MAJOR STUDY FINDING

1. Most of the adolescent girls were 18 and 19 years of age, most of them belong to Hindu religion, almost their family income between Rs. 3000 and Rs. 5000 and many of them were from nuclear family. All are taking non- vegetarian diet, none of them had taken previous treatment for anaemia, and most of them have more than 5 days of menstruation.

2. The majority of them 31 (51.67%)girls had moderate anaemia and 29 (48.3%) girls had mild anaemia and severe anaemia was not found among adolescent girls before nutrition ball intervention.
3. After nutritional intervention 47(78.3%) adolescent girls had changed from moderate anaemia to mild anaemia .
4. The nutrition ball intervention was very effective in increasing the haemoglobin level.
5. While comparing pre-test and post-test symptoms of anaemia among adolescent girls shows that the nutrition ball intervention was very effective in reducing the symptoms ($p<0.001$).
6. The pre mean value was 10.13 it increased after nutrition ball intervention 10.51.the mean deviation is 0.38. 't' value was 18.48 is higher than the table value 0.001,there is a significant deference in the haemoglobin level after nutrition ball intervention
7. Low cost iron rich nutrition ball intervention is easily available in the community and it is easy to prepare by the community people.

6.2 CONCLUSION

The study findings proved that the nutrition ball intervention increase the haemoglobin level and reduce the symptoms of anaemia among adolescent girls with iron deficiency anaemia. The subjects who received nutrition ball had a significant improvement in haemoglobin level. There was association between post test haemoglobin level and heavy menstrual flow, duration of menstrual cycle and drink tea/coffee per day.

6.3 IMPLICATION OF THE STUDY

According to Tolsma (1995) the section of the research report that focuses on nursing implication usually includes specific suggestions for nursing practice, nursing education, administration and nursing research.

Nursing practice

- Nutrition ball can be used to correct iron deficiency anaemia.
- It helps the nursing personnel to implement the effective use of low cost iron rich preparation at the community level to correct iron deficiency anaemia.
- The study findings will help the community health nurse to know the importance of adolescent health and motivate the adolescent girls to participate in various health programmes.
- Village health nurse has to plan the awareness programme in the village regarding the prevalence of anaemia .

Nursing Education

- The study will motivate the nursing personnel to include ragi flour nutrition ball as a low cost dietary management for iron deficiency anaemia in curriculum.
- Also enables the nursing personnel to include physical assessment as an approach to determine the level of iron deficiency anaemia in curriculum.
- Helps ht ensuring students to identify level of iron deficiency anaemia among adolescent girls through observation of symptoms.

- Student nurses have to update their knowledge regarding the method of identifying anaemia.
- Nursing curriculum has to focus on screening programme of anemic problems in subjects and motivate them to practice it.
- Nursing student have to update their knowledge regarding haemoglobin estimation by using Shali's haemoglobin meter.

Nursing Research

- This study motivate the investigators to conduct further studies related to this study
- Research on sustainable activities to develop awareness and decrease anaemia.
- The findings of the present study helped to do the same study in different age group.

Nursing administration

- Nursing administrator provide in- service education to improve their knowledge in various aspects of detection and management of iron deficiency anaemia.
- Nursing administrators should give more emphasis on conducting the health check up among adolescent girls.
- Administration in local and state government takes necessary action to develop positive attitude among adolescent girls regarding their health.

6.4 RECOMMENDATIONS

- Ongoing in-service education can be conducted to the community health nurse.

- Health teaching regarding the importance of iron rich diet supplementation in the community can be conducted.
- The same study can be do it in a large samples.
- The study can be conducted with health education
- The study can be conducted as a case control study.
- The study can be conducted with true experimental research design.
- The same study can be conducted as a comparative design with other nutritional interventions.

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- http://www.whoindia.org
- sarah.wild@ed.ac.uk
- enzobonora@virgilio.it

APPENDIX - A

SELF ADMINISTERED QUESTIONNAIRE EVALUATING THE EFFECTIVENESS OF NUTRITIONAL BALL AMONG ADOLESCENT GIRLS WITH IRON DIFFICIENCY ANEMIA IN SELECTED INDUSTRY HOSTEL IN MADURAI.

PART – I

DEMOGRAPHIC VARIABLES **SAMPLE NO :**

1.Age in years

a) 17 – 18 ☐

b) 18 – 19 ☐

c) 19 – 20 ☐

2.Education

a) Middle school ☐

b) High school ☐

c) Higher secondary school ☐

d) Professional ☐

3.Religion

a)Hindu ☐

b)Muslim ☐

c)Christian ☐

4.Family Income in Rupees

a) Rs. 3000 – 5000 ☐

b) Rs. 5001 – 10000 ☐

c) Rs. 10001 and above ☐

5.Type of Family

a)Nuclear ☐

b)Joint ☐

6.Type of Diet

a)Vegetarian ☐

b)Non – vegetarian ☐

7.Previous treatment for anemia ?

a) Yes ☐

b) No ☐

8 . Duration of menstrual days

a) 2 – 3 days ☐

b) 4 – 5 days ☐

c) > 5 days ☐

9.Duration of menstrual cycle

a) < than 28 days ☐

b) 28 days ☐

c) 30 days ☐

d) > than 30 days ☐

10. Menstrual flow

a) Heavy ☐

b) Moderate ☐

c) Scant ☐

11. How many times drink tea/coffee /day

a) Once a day ☐

b) Twice aday ☐

c) More than twice a day ☐

12. Do you wear chapels regularly?

a) Yes ☐

b) No ☐

13. Have you taken deworming treatment

a) Yes ☐

b) No ☐

14. Have you undergone any surgery?

a) Yes ☐

b) No ☐

PART - II

CLINICAL ASSESSMENT CHECK LIST

S.No	Signs and symptoms of Anemia	Pre – test		Post-test	
		Yes	No	Yes	No
1.	Paleness of conjunctiva				
2.	Pale tongue				
3.	Anorexia				
4.	Irritability				
5.	Fatigue				
6.	Worm infestation				
7.	Shortness of breath				
8.	Exercise intolerance				
9.	Pica				
10.	Palpitation				
11.	Glossitis				
12.	Stomatitis				
13.	Facial puffiness				
14.	Angular chelosis				
15.	Koilonychia				
16.	Pedal edema				

PART-III

Clinical assessment of haemoglobin estimation among adolescent girls before and after nutritional ball intake

(Sahli's methd of haemoglobin testing).

BIOPHYSIOLOGICAL MEASURMENT

SCORING PROCEDURE

Mild anemia - 10.1 to 11.9 gm%

Moderate anemia - 7 – 10 gm %

Sever anemia - < 7 gm % haemoglobin level

நேர்முகக் காணல் படிவம்

கீழே கொடுக்கப்பட்டுள்ள பகுதியில் உங்களை பற்றியும், இரத்த சோகை நோயைப்பற்றியும், கேள்விகள் உள்ளது. பொருத்தமான விடையை (✓) குறிப்பிடவும் நீங்கள் அளிக்கும் எல்லா விபரங்களும் ரகசியமாக பாதுகாக்கப்படும்

பிரிவு –அ

தனிவிபரப்பட்டியல்

1. வயது
   - அ) 17 – 18 ☐
   - ஆ) 18 – 19 ☐
   - இ) 19 – 20 ☐
2. மதம்
   - அ) இந்து ☐
   - ஆ) கிறிஸ்துவம ☐
   - இ) முஸ்லீம் ☐
3. கல்வித்தகுதி
   - அ) ஆரம்ப நிலைக் கல்வி ☐
   - ஆ) நடுநிலைக் கல்வி ☐
   - இ) உயர்நிலைக் கல்வி ☐
   - ஈ) படிக்கவில்லை ☐

4. குடும்பத்தின் மாத வருமானம்

அ) ரூ5000 கீழ் ☐

ஆ) ரூ.5001 – 10000 வரை ☐

இ) ரூ.10000க்கு மேல் ☐

5. குடும்ப வகை

அ) தனி குடும்பம் ☐

ஆ) கூட்டு குடும்பம் ☐

6. உணவு முறை

அ) சைவம் ☐

ஆ) அசைவம் ☐

7. இரத்த சோகைக்கு ஏதாவது சிகிச்சை எடுத்துக் கொண்டு இருக்கிறீர்களா?

அ) ஆம் ☐

ஆ) இல்லை ☐

8. மாத விலக்கு எத்தனை நாட்கள் இருக்கும்?

அ) 2-3 நாட்கள ☐

ஆ) 4-5 நாட்கள் ☐

இ) 5 நாட்களுக்கு மேல் ☐

9. மாத விலக்கின் போது இரத்த போக்கு எப்படி இருக்கும்?

அ) அதிகமாக ☐

ஆ) மிதமாக ☐

இ) குறைவாக ☐

10. மாதவிடாய் சூழற்சி நாட்கள்

அ) < 28 நாட்களுக்கு குறைவாக ☐

ஆ) 28 நாட்களுக்கு ஒருமுறை ☐

இ) 30 நாட்களுக்கு ஒருமுறை ☐

ஈ) > 30 நாட்களுக்கு மேலாக ☐

11. ஒரு நாளைக்கு எத்தனை முறை தேநீர் / காபி அருந்துவீர்கள்?

அ) ஒரு முறை ☐

ஆ) இரண்டு முறை ☐

இ) இரண்டு முறைக்கு மேல் ☐

12. காலணிகளை எப்பொழுதும் அணிவீர்களா?

அ) ஆம் ☐

ஆ) இல்லை ☐

13. குடல்புழு நீக்கத்திற்கு மருந்து எடுத்துள்ளீர்களா?

அ) ஆம் ☐

ஆ) இல்லை ☐

14. இதற்கு முன் அறுவை சிகிச்சை மேற்கொண்டு இருக்கிறீர்களா?

அ) ஆம் ☐

ஆ) இல்லை ☐

APPENDIX B

Ref. No. 9101/E4/3/2013 **Govt Rajaji Hospital,**
Madurai-20. Dated: 20.09.2013

Institutional Review Board I independent Ethics Committee,
Dr. N. Mohan, MS., F.LC.S F.A.I.S.,
Dean, Madurai Medical College &
Govt Rajaji Hospital, Madurai 625020. **Convener.**

Sub: Establishment-Govt. Rajaji Hospital. Madurai-20-
Ethics committee-Meeting Minutes- for August 2013
Approved list -regarding.

The Ethics Committee meeting of the Govt. Rajaji Hospital, Madurai was held on 08.08,2013, Wednesday at 10.00 am to 12.00.pm at the Anesthesia Seminar Hail, Govt. Rajaji Hospital, Madurai. The following members of the committee have attended the meeting.

1.Dr. V, Nagarajan, M.D., D.M (Neuro) Ph: 0452-2629629 Cell.No 9843052029	Professor of Neurology (Retired) D.No.72, Vakkil New Street, Simmakkal, Madurai -1	Chairman
2.Dr.Mohan Prasad. MS M.Ch Cell,No.9843050822 (Oncology)	Professor & H.O.D of Surgical Oncology(Retired) D.No.72, West Avani Moola Street. Madurai -1	Member Secretary
3.Dr.I.Jeyaraj,M.S... (Anatomy) Cell. No 9566211947	Director & Professor Institute of Anatomy /V,P Madurai Medical College	Member
4.Dr.Parameswari M.D (Pharmacology) Cell.No.9994026056	Director of Pharmacology Madurai Medical College	Member
5.Dr.S. Vadivel Murugan, MD., (Gen.Medicine) Cell.No 9566543048	Professor of Medicine Madurai Medical College	Member
6.Dr.S. Meenakshi Sundaram, MS (Gen.Surgery) Cell.No 9842138031	Professor & H.O.D of Surgery i/c Madurai Medical College	Member
7.Miss, Mercy Immaculate Rubalatha, MA., Med,, Cell. No. 9367792650	50/5, Corporation Officer's quarters, Gandhi Museum Road, Thamukam, Madurai-20	Member
8.Thiru..Pala..Ramasamy, BA.,B.L., Cell. No 9842165127	Advocate, D.No,72.Palam Station Road, Sellur, Madurai -2	Member
9.Thiru. P.K.M. Chelliah,B.A Cell.No 9894349599	Businessman, 21 Jawahar Street. Gandhi Nagar, Madurai-20	Member

The following Projects were approved by the committee

S.No	Name of P.G	Course	Name of the Project	Remarks
1.	A.Chellamani	M.Sc Nursing College of Nursing, Madurai Medical College	Effectiveness of nutrition ball on hemoglobin level among adolescent girls at selected industry hostel in Madurai	Approved

Please note that the investigator should adhere the following: She / He should get a detailed informed consent from the patients/participants and maintain it confidentially.

1.She / he should carry out the work without detrimental to regular activities as well as without extra expenditure to the institution or to Government,

2. She/he should inform the institution Ethical Committee, in case of any change of study procedure, site and investigation or guide.

3. She / He should not deviate the area of the work for which applied for Ethical clearance, She / He should inform the JEC immediately, in case of any adverse events or Serious adverse reactions.

4, She / He should abide to the rules and regulations of the institution,

5. She / He should complete the work within the specific period and if any Extension of time is required He / She should apply for permission again and do the work,

6. She / He should submit the summary of the work to the Ethical Committee on Completion of the work.

7. She / He should not claim any funds from the institution while doing the work or on completion.

8. She / He should understand that the members of IEC have the right to monitor the work with prior intimation.

Member Secretary **Chairman**
Ethical Committee

DEAN/Convenor
Govt. Rajaji Hospital,
Madurai- 20.

20/9/13

To
The above Applicants
-thro. Head of the Department concerned

APPENDIX – C

PERMISSION SEEKING LETTER

From

A.Chellamani

M.Sc (N) II year student

College of Nursing

Madurai Medical College,

Madurai.

To

The **DEPUTY DIRECTOR OF HEALTH SERVICES**

Viswanathapuram

Madurai.

Through : The proper channel

Respected Sir,

Sub : College of Nursing, Madurai Medical College, Madurai — M.Sc., (N) II year Community health Nursing Student — Permission for conducting study in Industry at Samayanallur requested — regarding.

I, Mrs. A.Chellamani, M.Sc (N) II year student, College of Nursing, Madurai Medical College, Madurai in fulfillment of M.Sc., Nursing course, have a plan to conduct a study on topic mentioned below in Industry at Samayanallur, Madurai — 20.

The topic is "**EFFECTIVENESS OF NUTRITIONAL BALL ON INCREASE IN HAEMOGLOBIN LEVEL AMONG ADOLESCENT GIRLS WITH IRON DIFFICIENCY ANAEMIA AT SELECTED INDUSTRY IN MADURAI.".**

Kindly consider my request and permit me to conduct the study.

PLACE: MADURAI

DATE : 30-8-2013.

Thanking you,

Yours faithfully,

A. Chellamani

Forwarded
S.P
30/8/13
Principal I/c
COLLEGE OF NURSING
Madurai Medical College
Madurai-20.

DEPUTY DIRECTOR OF HEALTH SERVICES MADURAI.

APPENDIX - C

PERMISSION SEEKING LETTER

From

A.Chellamani

M.Sc (N) II year student

College of Nursing

Madurai Medical College,

Madurai.

To

The Block Medical Officer

Primary Health Centre,

Samayanallur, Madurai.

Through : The proper channel

Respected Sir,

Sub : College of Nursing, Madurai Medical College, Madurai — M.Sc., (N) II year Community health Nursing Student — Permission for conducting study in Industry at Samayanallur requested — regarding.

I, Mrs. A.Chellamani, M.Sc (N) II year student, College of Nursing, Madurai Medical College, Madurai in fulfillment of M.Sc., Nursing course, have a plan to conduct a study on topic mentioned below in Industry at Samayanallur, Madurai — 20.

The topic is "**EFFECTIVENESS OF NUTRITION BALL ON HAEMOGLOBIN LEVEL AMONG ADOLESCENT GIRLS WITH IRON DIFFICIENCY ANAEMIA AT SELECTED INDUSTRY HOSTEL IN MADURAI.".**

Kindly consider my request and permit me to conduct the study.

Thanking you,

Yours faithfully,

PLACE: MADURAI

DATE : 30-8-2013.

A. Chellamani

BLOCK MEDICAL OFFICER
Govt. Primary Health Centre.
Samayanallur
Madurai Dist

Forwarded
S.P
30/8/13
Principal I/c
COLLEGE OF NURSING
Madurai Medical College
Madurai-20.

APPENDIX - C

GHCL Limited

(UNIT : SREE MEENAKSHI MILLS)

Date: 18/09/20 13

The Principal,

Madurai Medical College,

Madurai.

Dear Sir/Madam,

With reference to your requisition, we are happy to inform you that, we are permitting your student **Mrs.A.CHELLAMANI,** Second year M.Sc (Nursing) to do her dessertation on **"Effectiveness of nutritional intervention on increase in haemoglobin level among adolescent girls (Age group: 18 & l9yrs) with aneamia"** in our Paravai Unit.

Jayamuthumagesh.V
Manager – HR

For GHCL Limited

(Unit: Sree Meenakshi Mills)

Paravai, Samayanallur P.O., Madurai - 625 402. Ph : 00-91-0452-3983000, 2463350 Fax : 0452-3983200, 2463450 e-mail : ghclmdu@ghcl.co.in
Regd. Office : GHCL House, Opp. Punjabi Hall, Near Navrangpura Bus Stand, Navrangpura, Ahmedabad - 380 009

From

A.CHELLAMANI,
M.Sc Nursing II Year,
College Of Nursing,
Madurai Medical College,
Madurai -625020

To,

THE HEAD OF THE DEPARTMENT
Department of Pathology,
Madurai Medical College
Madurai.

Respected Sir,

As a part of my curriculum requirement I am planning to conduct a study on "EFFECTIVENESS OF NUTRITON BALL ON HEMOGLOBIN LEVEL AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANEMIA AT SELECTED INDUSTRY HOSTEL IN MADURAI". I kindly request to you to provide your valuable suggestion that all selected subjected have iron deficiency anemia through blood smear investigations. Hoping your generous consideration for your valuable opinion in typing the anemia.

Thanking You

Yours faithfully

Place: Madurai
Date: 4.9.2013

4/9/13

PROFESSOR AND HOD OF PATHOLOGY
MADURAI MEDICAL COLLEGE
MADURAI-625020

Forwarded for consideration.
For Principal
04/09/13.

N. NAGARATHINAM, M.Sc.,(N)
LECTURER IN CHILD HEALTH NURSING
College of Nursing
Madurai Medical College
Madurai.

APPENDIX D

CERTIFICATE OF VALIDATION

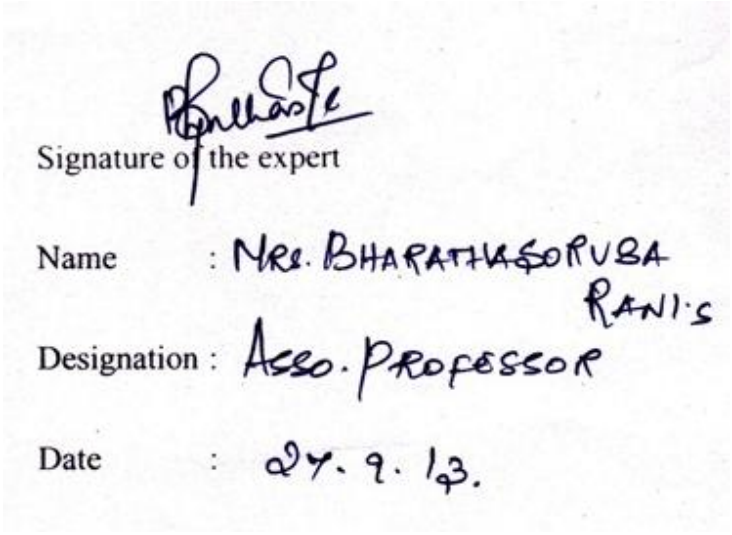
This is to certify that the tool

SECTION - A - Demographic data

SECTION - B - Clinical Assessment check list

SECTION - C - Assessment of patients Haemoglobin level by biophysiological measurement.

prepared for data collection by A.CHELLAMANI II year M.Sc (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken the study field o thesis "**Effectiveness of nutrition ball on haemogloin level among adolescent girls with iron deficiency anaemia at selected Industry hostel in Madurai"** has been validated by me.



APPENDIX D
CERTIFICATE OF VALIDATION

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SECTION A — Demographic data

SECTION B — Clinical Assessment check list

SECTION C — Assessment of patient's Haemoglobin level by Biophysiological Measurement.

Prepared for data collection by A.CHELLAMANI. II year M.Sc (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken the study field on thesis **"Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected Industry hostel in Madurai**", has been validated by me.

Signature of the expert

J. John Sam Arun Prabu.
M.Sc.,(N)M.Sc.,(Psy),PGDHM
HOD, Community Health Nursing
CSI Jeyaraj Annapackiam
College of Nursing
Peyumalai, Madurai-625 004

Name : Y. John Sam Arun Prabu.

Designation : Professor.

Date : 3/9/13.

APPENDIX D

CERTIFICATE OF VALIDATION

This is to certify that the tool

SECTION A — Demographic data

SECTION B — Clinical Assessment check list

SECTION C — Assessment of patient's Haemoglobin level by Biophysiological Measurement.

Prepared for data collection by A.CHELLAMANI. II year M.Sc (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken the study field on thesis **"Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected Industry hostel in Madurai**", has been validated by me.

Signature of the expert M.Saleem 11/9/13.

Name : Dr. M. SALEEM. MD (Com. med)

Designation : ASSOCIATE PROFESSOR
Institute Of Community Medicine
Madurai Medical College
Madurai

Date :

APPENDIX D

CERTIFICATE OF VALIDATION

This is to certify that the tool

SECTION A — Demographic data

SECTION B — Clinical Assessment check list

SECTION C — Assessment of patient's Haemoglobin level by Biophysiological Measurement.

Prepared for data collection by A.CHELLAMANI. II year M.Sc (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken the study field on thesis **"Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected Industry hostel in Madurai**", has been validated by me.

Signature of the expert

Name : VIVEKANANTHAN

Designation : Dr. S.C. VIVEKANANTHAN

Date : 11.9.2013

APPENDIX D

CERTIFICATE OF VALIDATION

This is to certify that the tool

SECTION A — Demographic data

SECTION B — Clinical Assessment check list

SECTION C — Assessment of patient's Haemoglobin level by Biophysiological Measurement.

Prepared for data collection by A.CHELLAMANI. II year M.Sc (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken the study field on thesis **"Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anaemia at selected Industry hostel in Madurai**", has been validated by me.

Signature of the expert

JULIET SYLVIA. H
Professor & Head of the Department
Community Health Nursing
Sacred Heart Nursing College
MADURAI 625020

Name Dr. JULIET SYLVIA

Designation : Professor

Date : 10/09/13

APPENDIX E

QUALITY CONCEPTS
67, 1st Floor, P&T Nagar Main Road,
P&T Nagar, Madurai - 625 017.
Tel : 91-452-4231644
E-mail : qualityconcepts@in.com

CALIBRATION CERTIFICATE

01.Certificate No. & Date : 20131710 19.11.2013

02. Page no. : 01 of 01

03.Name of the Client : **A.Chellamani, Madurai.**

04.Name of the Instrument : Haemometer

05.Identification No. of the instrument : -

06.Range of the instrument : -

07. Least Count : -

08.Make : Sahli Haemometer

09.Calibrated on : 16.11.2013

10.Next Calibration due on : 16.11.2014 (User defined)

11.Standards Followed : -

12. Calibration Results

Sl. No.	Indicated Value mg/dl	Standard Value mg/dl	Error mg/dl
01	11.99	12	-0.01

13. Calibration Traceable to : STANDARD SOLUTIONS

14. Allowable Tolerance as per IS 3390 : $\pm$ 0.2 mg/dl

15. Instrument status : Deviations are within specified limits

Note: Calibrated and certified for ISO and other Quality System Standards' requirement. The results were observed at the time of calibration.

Calibrated by
Signature :
Designation : Chief Technician

QUALITY CONCEPTS ★ MADURAI ★

Approved by
Signature :
Designation : Director

APPENDIX F

CERTIFICATE OF TAMIL EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation by **A.CHELLAMANI** II year M.Sc., (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken by study field on Dissertation entitled "**Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anemia at selected industry hostel in madurai.**" has been edited for Tamil language appropriateness.

NAME: K.SOUNDARAPANDIAN

SIGNATURE

அறிஞர் அண்ணா
அரசினர் மேல் நிலைப் பள்ளி,
அய்யன்பேட்டை.

DESIGNATION: P.G. ASST IN TAMIL

INSTITUTION: A.A. Govt. Hr SEC. SCHOOL
AYYANPETTAI.

அறிஞர் அண்ணா அரசினர் மேல்நிலைப் பள்ளி
நாள் 9.1.13
அயன்பேட்டை-631601

APPENDIX F

CERTIFICATE OF ENGLISH EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation by **A.CHELLAMANI** II year M.Sc., (N) student, College of Nursing, Madurai Medical College, Madurai, who has undertaken by study field on Dissertation entitled "**Effectiveness of nutrition ball on haemoglobin level among adolescent girls with iron deficiency anemia at selected industry hostel in madurai.**" has been edited for English language appropriateness.

NAME: R. JAYA

SIGNATURE

DESIGNATION: P.G. Assistant (ENGLISH)

INSTITUTION:

அறிஞர் அண்ணா அரசினர் மேல்நிலைப் பள்ளி
நாள் 9.1.13
★ மேலூர் ★
அய்யம்பேட்டை-631601

APPENDIX - G

ஒப்புதல் படிவம்

பெயர் : தேதி :

வயது : ஆராய்ச்சி சேர்க்கை எண்.

மதுரை மாவட்டம், பரவை GHCL மில்லில் பணிபுரியும் இரும்புசத்து குறைவால் ஏற்படும் இரத்தசோகை இருக்கும் எனக்கு சத்து மாவு உருண்டை (எள், கேழ்வரகு, பொட்டுகடலை, வெள்ளம்) ஒரு நாளைக்கு இரண்டுமுறை தொடர்ச்சியாக 30 தினங்களுக்கு சாப்பிடகொடுத்து இரத்தத்தில் ஹிமோகுளோபின் அளவை அதிகரிக்கிறதா என்பதை அறிய எனக்கு பூரண சம்மதம். இதனால் எந்தவித இடையூறும், விளைவும் ஏற்படாது என்று ஆராய்ச்சியாளர் மூலம் விரிவாக எடுத்துரைக்கப்பட்டது. இந்த ஆராய்ச்சியை நடத்த என்னுடைய ஒத்துழைப்பையும், சம்மதத்தையும் முழுமனதுடன் தெரிவித்துக் கொள்கிறேன்.

கையொப்பம்

RESEARCHER ASSESSING THE HEMOGLOBIN LEVEL USING SAHLI'S HEMOGLOBINOMETER

RESEARCHER COLLECTION OF DATA AND GETTING INFORMED CONSENT

ADMINISTRATION OF NUTRITION BALL