



ISSN: 2395-7476

IJHS 2025; 11(1): 186-191

© 2025 IJHS

www.homesciencejournal.com

Received: 23-12-2024

Accepted: 14-01-2025

Dr. Niharika Paliwal

Bhattyani Chohatta, Asha Pal

Gali, Udaipur, Rajasthan, India

Prevalence of iron deficiency anemia among adolescent girls and impact of health and nutrition education programme in changing their dietary behaviour

Niharika Paliwal

DOI: <https://doi.org/10.22271/23957476.2025.v11.i1c.1774>

Abstract

The present study has been undertaken to assess the "Prevalence of Iron deficiency anemia among adolescent girls and impact of health and nutrition education programme in changing their dietary behaviour". For this purpose a sample of 30 each adolescent girls of 14-19 yrs. were selected. A pre-tested interview schedule was developed to collect information regarding nutritional status by dietary survey (24.hrs. recall method), anthropometric measurements (height, weight and BMI). Clinical and hemoglobin estimation to assess the nutritional status of the adolescent. Dietary survey revealed that the diet of the adolescent girls in comparison to the balanced diet was substantially inadequate. Cereals and pulses were food consumed by all the people. Consumption of other food groups was by few subjects. Intake of the entire food group as percentage of balanced diet was low. Inadequacy was observed in case of all nutrients, except vitamin-B (Thiamin & riboflavin) and vitamin A in adolescent girls. while low level of other nutrients like vitamin C, iron, folic acid and calcium was assessed in adolescent people as compared to RDA (Pasricha & Thiammyamma, 1992). By the assessment of prevalence of clinical signs/symptoms and hemoglobin estimation showed that the mean hemoglobin level of adolescent girls showed that 30% percent adolescent girls were falling in moderate category of anemia 50% percent people were severely anemia and very few (20%) subjects were falling in mild category of anemia. From the above results it can be concluded that overall nutritional status of adolescent people was not satisfactory and they were having higher prevalence of iron deficiency anemia.

Keywords: Adolescent, rural, urban, habits, attitudes, education

Introduction

The word 'adolescence' come from the Latin word Adolescence which means to grow to maturity it is a critical period of human development, which is manifested by physiological, psychological, emotional, and social changes in human life it is marked by the end of childhood and beginning of adulthood on an average adolescence extends from 13 to 18 years for girls and from 14 to 18 years for boys (Isenberg 1965) ^[9].

Nutritive requirements for boys and girls reach the maximum during the period of pre-adolescence and adolescence one of the most critical nutrient for this age is iron it is an hemoglobin of the red blood cells. The main function of iron in hemoglobin to carry oxygen from the lungs to other body tissues and respiration of tissue level through iron containing enzymes an intake of 25 mg. daily is suggested for girls of 13-18 years in order to take care of the increased iron requirements during the adolescent growth spurt and to ensure an adequate storage of iron for early adult life. Since this age marks the onset of the menstrual cycle for girls. It is particularly important that they have an adequate supply of iron.

The Indian diets are based on cereals, pulses, green leafy vegetables, condiments and spices though the grains are fairly good source of iron, the majority of Indians are suffering from iron deficiency anemia due to the presence of high amounts of phytates oxalates and tannins in the diets. Along with this the diets are also poor in ascorbic acid and protein, a situation which would lead to poor absorption of dietary iron.

Iron deficiency anemia is a worldwide nutritional problem, the magnitude of this problem is much greater in developed countries it is common in children and in adolescent girls, when their needs high and the foods eaten to be

Corresponding Author:

Dr. Niharika Paliwal

Bhattyani Chohatta, Asha Pal

Gali, Udaipur, Rajasthan, India

a poor source of iron. In addition to this there is an extra iron loss of 0.5 mg/day due to menstrual blood loss (Hallberg, 1969) [10] in adolescent girls, leading to a condition of iron deficiency anemia which interferes with the health preparation for pregnancy and work efficiency. It is a many changes that take place during adolescent age have direct impact on the food intake and nutritional status of adolescence people. Malnutrition among adolescent is caused by a number of factors such as condition of the family, ignorance, superstition, lack of food, poor environmental, undesirable social customs, traditional prejudices and frequent infection. Certainly a life time of sensible eating can contribute a great deal; considerable research has accumulated to show the importance of role of nutrition in living long and living well.

Adolescence is a critical stage in the life cycle, when the health of females is affected due to growth spurt, beginning of menstruation, poor intake of iron due to poor dietary habits and gender bias. Iron deficiency anaemia affects over 60% of the adolescent girls in India. Anaemia in adolescent girls has far-reaching implications. The anaemic adolescent girls grow into adult women with compromised growth, both physical and mental. These women have low pre-pregnancy weight, and are more likely to die during childbirth and deliver low birth weight babies (UNICEF, 2012) [6].

Statement of the problem

Adolescent is one of the most challenging period in Banan development. The relatively uniform growth of childhood is subifently altered by a raped increase in the growth rate. The sudden changes creatie nutritional needs. Adolescent is considered as especially nutritionally valineratile period for several reasons. First they have an increased demand for nutrients dramatic of the dramatic increase in physical growth and development. Second the change in the life style and food habits of adolescens effect nutrients intake and needs. Third adolescence nutrient needs are effected by participation in sports, pregnancy, and development of an eating disorder, excess diet, one of alcohol anil drugs or some other situations. In world health report of World Health Organizations (WHO) states that the world wide mortality rate of iron deficiency anemia is 60,404,000 in 2005 (WHO, 2005).

Epidemiological research conducted on sample drawn from the population will throw light on various factors responsible for inappropriate dietary intake in adolescence age. Hence an investigation was under taken to explore the "Prevalence of Iron deficiency anemia among adolescent girls and impact of health and nutrition education programme in changing their dietary behaviour", residing in a Udaipur district with the following objectives.

Objectives of the study

1. To assess the nutritional status of the sample by anthropometric measurements.
2. To examine the clinical signs and symptoms of the study group there by assessing the presence of various nutritional deficiencies.
3. To assess the prevalence of iron deficiency anaemia among the sample group by biochemical test.
4. To assess the change in haemoglobin levels of anaemic sample after imparting Health and Nutrition Education.
5. To assess 24 hour dietary intake of the sample.

Methodology: The methodology of the present investigation entitled "Prevalence of iron deficiency anemia among

adolescent girls and impact of health and nutrition education programme in changing their dietary behaviour", has been discussed in this

Chapter under following sections

1. Locale of the
2. Selection of sample
3. Development of tool & collection of Data
4. Analysis of Data

Locale of the study

The present study was conducted on 14-19 years of adolescent girls in the selected Guru Nanak Girls P.G. college of Udaipur district of Rajasthan.

Selection of sample

The sample for the present study was comprised of 30 adolescent girls in the age group of 14-19 years. For the selection of subjects, college was contacted. Thirty subjects were surveyed on the basis of their cooperation and availability at the time of survey till the required sample size was covered.

Development of tool & collection of data

For the assessment of nutritional status, an interview schedule was developed to collect the information as per the objectives of the study. Interview schedule was developed by the investigator after extensive review of literature in consultation with subject matter specialists. The developed interview schedule included following sections:

Section 1: Background information

Section 2: Assessment of nutritional status

- a) Dietary survey
- b) Clinical Examination
- c) Biochemical Examination

Section 1 Background information: This section gathered infirmation related personal particulars and swocin economic status. This part included information afront respondent's age, religion, caste, type and size of family, education, family occupation, marital status, organizational membership, media ownershippcmory of adolescent girls

Measurement of Variables: Independent variable in the stily refers to perwinal particulars of the respondent's viz. age, cante, type and size of family, education, family occupation, marital status, organizational membership, media ownership, financial status of the family, obstetric history of adolescent girls. The details of these attributes with their respective measures are as follows:

Age: Age of the respondents was defined as the numbers of years completed by the respondents at the time of interview. The respondents were grouped on the basis of their age as follows:

- a) 14-16 years
- b) 17-19 years

Education: On the basis of education level, respondents were grouped under following categories:

- a) Illiterate
- b) Can sign
- c) Can read and write
- d) Primary

- e) Middle
- f) Secondary
- g) Graduation & above

Caste: Information regarding caste of the respondents was recorded under for categories:

- a) SC
- b) ST
- c) OBC (Other backward castes)
- d) General or upper caste

Marital Status: Marital status was categorized into these groups:

- a) Unmarried
- b) Married
- c) Widows
- d) Divorced

Type of family: Depending upon the composition of the family. Respondents were categorized into two categories:

- a) Joint family
- b) Nuclear family

Section 2: Assessment of Nutritional status

Adequate dietary intake is fundamental for good health & good quality of life. Inadequate nutrition ranks as one of the major problems of adolescent age. There is a strong association between nutrition and many digestive diseases that commonly affect the adolescence. Nutritional status of an individual is assessed by several methods. It includes dietary, anthropometric, clinical, biochemical assessment.

Methods of nutritional status assessment used in the present investigation are given below

Dietary survey: Detailed information on dietary intake of adolescent girls was gathered by "24 hours recall method". Actual diet consumed by the subjects was found out with the help of standard set of cups. From the cooked and raw amount of foods, the raw amount of foods consumed by each subject was then calculated.

Food habits: On the basis of food generally consumed by they were categorized into these categories:-

Vegetarian: A vegetarian is a person who uses a diet that includes plant food but eliminates one or more of these foods, meat, poultry, fish & egg.

Non-vegetarian: Non vegetarian person includes plant food, milk, egg, meat, poultry, and fish in the diet.

Ovo-vegetarian: Consuming egg along with plant food, milk & milk products, they abstain from meat, poultry.

Clinical Examination: The clinical examination of each subject was carried out by observation with help of medical doctor. Each individual subject was examined for the signs and symptoms of iron deficiency as recommended by Jelliffe (1966), and observations were recorded in the interview scheduled for following parts:

Protein Energy malnutrition

- a) Dispigmentation of hair
- b) Skin changes
- c) Gross muscular wasting/loss of subcutaneous fat.

Anemia

- a) Pallor/conjunctiva/ mucus membrane

- b) Koilonychias
- c) Easy Fatigability

Vitamin A

- a) Conjunctival Xerosis
- b) Bitot spot
- c) Corneal Xerosis
- d) Night Blindness

Other

- a) Red/glazed tongue
- b) Bleeding gums
- c) Dental Carries.

Hemoglobin estimation

Hemoglobin determination is regarded as a screening indexed in defining degree of iron deficiency (INACO, 1985) this may be diagnosed carefully, confidently when the hemoglobin clear out the level considered normal for the persons ages and refine the of hemoglobin is circulating blood is one of the best laboratory test seeing of a (Demalyer, 1988).

Procedure: The finger tip of the subjects was cleaned and 0.02 ml blood was drawn in a dry pipette by pricking the fingertip with a sterilized disposable needle. The blood was deposited on a small piece of (7x7 cm.) Whatman no. 1 filter paper. The filter paper was allowed to dry which took about 20 minute. The samples thus collected, were brought to the laboratory for Hb estimation. The portion of the filter paper on which blood was deposited was cut and transferred to a test tube containing 5 ml. of Drabkin's reagent after one hour when all the blood was extracted into Drabkin's reagent, the concentration was determined by using Hemoglobin meter (Systronics-185)

Prevalence of anaemia: On the basis of Hemoglobin levels, the subjects were classified into four groups as suggested by WHO (1989)

Classification of hemoglobin level

HB level (g./dl) Interpretation

Men	Women
>14.0	<12.0
12-14	10-12
9-12	7-10
<9.0	<7.0

Analysis of Data: The data were statistically analyzed as per the objectives of the study. Information about subjects and their families were expressed as percentage. Mean+ standard error value were also calculated for dietary intake, and biochemical parameters.

Standard deviation and Standard error: Standard deviation and standard error of all the variables were computed. Development of intervention programme For Reducing Iron Deficiency Anaemia and Changing Dietary Behaviour among Adolescent Girls
Educational material used in the programme were visual aids in the form of posters and charts. Lecture method was also used to incorporate information regarding various nutrients.

The objective of the intervention program was

1. To make group aware of various food groups.
2. To encourage girls to consume iron rich foods.
3. To encourage girls to consume vitamin C rich foods which help in absorption of iron.

4. To make the adolescent girls aware about Recommended Dietary Allowances.

Results and discussion

This chapter deals with the results and their interpretation in relation to the objectives framed for the investigation conducted to find out "Prevalence of iron deficiency anemia among adolescent girls and impact of health and nutrition education programme in changing their dietary behaviour". This chapter has been divided into the following sections:

Background information of the respondents

This section deals with the general information *viz.* age, caste,

type and size of family of the family, and socio-economic status of the respondent. Results are presented as follows (Table 1, 2 and 3).

Age: The age profile of the respondents as indicated in Table 1 revealed that (%) of the adolescence girls respondents were between 14-16years, while percent adolescence girl's respondents were female were in the age range of 17-19 years.

Religion: Scrutiny of data reflects that all the subjects of the study were Hindu.

Table 1: Distribution of respondents according to their age, religion and family structure

S. No.	Variable	Adolescence Girls (14-16 yrs.) (n=15)	Adolescence Girls (17-19 yrs.) (n=15)	Total (n=30)
A	Age	15 (100)	15 (100)	30 (100)
B	Religion	Hindu (15, 100%)	Hindu (15, 100%)	Hindu (30, 100%)
C	Family Structure			
	Family Type			
	Nuclear	10 (66.6)	11 (73.3)	21 (70)
	Joint	5 (33.3)	4 (26.6)	9 (30)

Figures in parentheses represent the percentage of subjects.

(C) Family structure: Table depicts that majority of the respondents (%) were from the nuclear family and rest of them (30.0%) belonged to joint family. With regards to size of the family.

Nutritional assessment of the adolescence people

(a) Dietary adequacy: Nutrition is an important aspect of healthful behavior and major components of general well-being of individuals throughout their life cycle and is an

important factor contributing to aging. A number of factors can cause iron deficiency anemia is an individual and diet is one of them.

For this purpose, a dietary survey was conducted using "24 hour recall" method for one day and the observations so obtained have been interpreted in view of dietary and nutrient adequacy.

Table 2: Distribution of Adolescence Subjects (14-19 yrs.) by Their Food Habits

S. No.	Details	Adolescence Girls (14-16 yrs) (n=15)	Adolescence Girls (17-19 yrs) (n=15)	Total (n=30)
1	Vegetarian	4 (26.7)	6 (40)	12 (40)
2	Non-Vegetarian	6 (40)	6 (40)	8 (27)
3	Non-Vegetarian but usually Vegetarian	5 (33.3)	5 (33.3)	10 (34)

Figures in parentheses represent the percentage of subjects.

Food habits

Data in Table 5 depicts the percentage distribution of the respondents by their food habits, 40% respondents were vegetarian, 27 percent respondents Non-vegetarian, while 34 percent respondents were non-vegetarian but usually vegetarian.

Meal pattern: The general meal pattern of (Table 6) revealed that four meal pattern was being followed by most of the adolescence people. The adolescence people were taking the morning and evening tea. The major meals (lunch & dinner) included mainly chapatti, rabri, rice, dal or both with seasonal vegetables or root vegetables.

Table 3: General meal pattern of the adolescence people

S. No.	Meal	Preparation Consumed
1	Breakfast	Tea
2	Lunch	Chapatti/rice or both with vegetable/dal
3	Evening tea	Tea/Milk
4	Dinner	Chapatti with rabri, vegetables, or dal

Prevalence of Anemia

Clinical assessment: Clinical examination is another method for measuring the nutritional status & prevalence of deficiency diseases. In the present study the clinical signs

have been assessed as recommended by the Jelliffe (1986)^[11]. 120 respondents were clinically examined for the presence & absence of clinical signs & symptoms presented in Table-13.

Table 4: Prevalence of clinical signs/symptoms of iron deficiency anemia among adolescent subjects.

S. No.	Details	Adolescence Girls (n=15) (14-16 yrs.)	Adolescence Girls (n=15) (17-19 yrs.)	Total (n=30)
(A)	No clinical signs & symptoms	14 (93.3)	14 (93.3)	28 (93.3)
(B)	Clinical signs & symptoms present			
1	Pale conjunctiva	5 (33.3)	4 (26.6)	9 (30)
2	Pale tongue	2 (14)	3 (20)	5 (16.6)
3	Koilonychia	3 (20)	4 (26.6)	4 (13.5)
4	Easy fatiguability	5 (33.3)	2 (20)	8 (27)

Table revealed that signs & symptoms of iron deficiency anemia among adolescence respondents were pale conjunctiva (30%), pale tongue (13.5%), koilonychias (17%) and easy fatigability (27%), also table shows that in both groups of the subjects (13.5%) had no clinical sign & symptoms of iron deficiency anemia.

Hemoglobin assessment: Hemoglobin concentration is a very important indicator of state of health as it maintains normal oxygen carrying capacity nourishing the tissues. With

advancement of age hemoglobin production declines. This condition coupled with reduced pulmonary function, depriver other internal organs of proper oxygenation & failure utilize available energy supply, making the physical condition worse day by day.

Anemia may be diagnosed confidently when the Hb concentration is lower than the level considered normal for the person's age/sex and therefore, the measurement of Hb in circulating blood is one of the best laboratory tests for screening for anemia.

Table 5: Mean Blood Hemoglobin Level (g/dl) Among Adolescent Girls

Mean Blood Hemoglobin Level (g/dl)	Adolescence Girls (n=15) (14-16 yrs)	Adolescence Girls (n=15) (17-19 yrs)	Total (n=30)
Mean \pm SD	8.77 \pm 0.191	7.64 \pm 0.142	8.20 \pm 0.166

Note: The cutoff hemoglobin levels suggested by WHO (1989) were considered for analysis.

Male:-14 g/dl, Female: - 12 g/dl

The mean concentration of Hemoglobin among the adolescence subjects is shown in Table 14. The mean Hb concentration of adolescence Subjects. (16-18yrs) was 8.77g/dl and in case of 18-20yrs subjects was 7.64g/dl.

Table 6: Prevalence of Anemia by Hemoglobin Levels among Adolescent Girls

Anemia Grade & Hemoglobin (g/dl)	Categories	Adolescence Girls (n=15) (14-16 yrs)	Adolescence Girls (n=15) (17-19 yrs)	Total (n=30)
Men <14.0, Women <12.0	Normal	Nil	Nil	Nil
12-11	Mild	3 (20%)	3 (20%)	6 (20%)
11-9	Moderate	4 (26.6%)	5 (33.3%)	9 (30%)
<9.0	Severe	8 (53.3%)	7 (47%)	15 (50%)

Figures in parentheses represent the percentage of subjects in each category. #Classification is based on WHO guidelines.

Table 7: Change in Hemoglobin Levels of Anemic Sample after Imparting Health and Nutrition Education

Anemia Grade & Hemoglobin (g/dl)	Categories	Adolescence Girls (n=15) (14-16 yrs)	Adolescence Girls (n=15) (17-19 yrs)	Total (n=30)
Men <14.0, Women <12.0	Normal	4 (26.6%)	5 (33.3%)	9 (30%)
12-14 (Men), 10-12 (Women)	Mild	5 (33.3%)	5 (33.3%)	10 (33.3%)
9-12 (Men), 7-10 (Women)	Moderate	5 (33.3%)	4 (26.6%)	9 (30%)
<9.0 (Men), <7.0 (Women)	Severe	1 (6.6%)	1 (6.6%)	2 (6.6%)

Table 15 present percentage prevalence of anemia among adolescent respondents. Overall only 20 percent respondents had mild Hb value, while 30percent respondents were moderately anemic and 50percent were severely anemic. On the basis of Hb levels the subjects were divided in four groups ie, severe, moderate, mild, and normal for both groups of adolescent girls subjects (WHO, 1989).

The present study indicates that anemia is widely prevalent among adolescent people of Alwar District. In India the major cause of anemia is iron deficiency because of inadequate intake of iron from the diets based predominantly on cereals. Regardless of the cause of anemia, it adversely affects the health status and functional capacity of the adolescent group who are socially isolated. Iron status has strong association with aging process which affects adversely the immune as well neurological function. In the adolescent, anemia can either be nutrition related or due to blood loss from the gastrointestinal tract, It is however, difficult to estimates the incidence of iron deficiency anemia in the adolescent because normative changes in iron status indicators with age have not been defined so far.

Extension of national prophylaxis programme by the government to meet the demands iron intake for the burgeoning population of adolescent is the need of the hour. However, it is equally essential to study the causes of anemia like haemolytic disorders, infections and communicable diseases which are said to be prevalent in the rural areas. Reducing iron deficiency anemia can not only improve nutrition & work, out-put of the adolescent but also the overall health status that ensures a better quality of life.

Summary and Conclusion

Anemia is a major nutritional problem in India affecting all segments of the population. Adolescent people are at risk of anemia because of pre-agriculture level of technology, illiteracy, poverty, traditional way of life and subsistence economy.

The present study was conducted "Prevalence of Iron deficiency anemia among adulescent girls and impact of health and nutrition education programme in changing their dietary behaviour". The study was undertaken in, District Udaipur. For this purpose, samples of 30 adolescent girl's

subjects (14-19 yrs) were selected with equal representation. Data pertaining to the information about respondents, their socio-economic status, food consumption pattern, dietary intake, anthropometric measurement, clinical assessment and hemoglobin assessment were gathered through interview schedule.

Food intake was assessed by using "24 hour recall" method where as for the anthropometric measurements height and weight were taken to find out body mass index as suggested by James *et al.* (1988) [12]. Hemoglobin levels were estimated by cyanmethemoglobin method and divided in different categories of anemia as suggested by WHO (1989).

The observations so obtained were statistically analyzed by using standard techniques like mean, percentage, standard error. The results pertaining to general information was gathered including age, caste, religion, family size and type etc. General information about the respondent's picturized that majority of 50 percent girls belonged to 14-16 yrs of age, while 50.0 percent people belonged to 17-19 yrs. Religion and caste of all the age groups revealed that all of the respondents were Hindu.

Regarding the family structure 30.0 percent respondents were from the joint family and rest of them (70.0%) belonged to nuclear family.

Socio-economic status of the respondents showed that about half of the subjects either belonged to low socio-economic status (40.0%) or medium socio-economic status (34.0%), only few subjects (27%) were from high socio-economic status.

Distributions of subjects on the basis of hemoglobin level showed that 20.0 percent adolescent people were mild anemic 30.0 percent were falling in moderate category of anemia and 50.0 percent respondents were severely anemic. The clinical examination result showed that the entire subject had pail less of appetite, menstrual disturbance and shortness of breath,

This study thus indicates that anemia is a major nutritional problem along with poor socio-economic. Majority of the adolescent girls were anemic as indicated by Hb level. The nutritional status of adolescent girls was not satisfactory and they were having higher prevalence of anemia.

Nutrition programmes & policies must also cover this segment of population to the betterment of nutritional status among adolescent girls. At the same time, nutrition education of adolescent people about intake of locally available foods rich in iron & folic acid goes a long way in preventing and controlling anemia in its special risk group adolescent people who are of higher risk of malnutrition.

References

1. Adams JF. Understanding Adolescents Current Developments in Adolescent Psychology. 2nd ed. Stanley O, Kochman; 1973.
2. Agarwal D, Agarwal DK. Nutritional anaemia and its control. *Indian J Pediatr.* 2002;69(7):607-616.
3. Abdelrahim II, Mahgoub HM, Mohamed AA, Ali NJ, Elbashir MI, Adam I. Anaemia, folate, zinc and copper deficiencies among adolescent schoolgirls in Eastern Sudan. *Biol Trace Elem Res.* 2009;132(1-3):60-66.
4. Bülent K, Sanda C, Ayşen A, Nanzan S. The prevalence of anaemia in adolescents. *J Pediatr Hematol Oncol.* 2006;5:316-321.
5. Campbell MA, McGrath PJ. Use of medication by adolescents for the management of menstrual discomfort. *Arch Pediatr Adolesc Med.* 1997;151(19):905-913.
6. Government of Bihar, UNICEF. Experiences in Bihar

- Directorate of Social Welfare, Department of Education, Department of Health and Family Welfare [Internet]. 2012 [cited YYYY MMM DD]. Available from: <http://www.newconceptinfo.com/sites/default/files/Unicef-Control-of-Nutritional-Anaemia-in-School-Going-Adolescent-Girl-Experiences-Bihar.pdf>
7. Cooper MJ, Cockell KA, Abbé M. The iron status of Canadian adolescents and adults. *Can J Diet Pract Res.* 2007;67(3).
 8. Terhune ALF, Cogswell ME, Khan LK, Will JC, Ramakrishnan U. Iron deficiency anaemia: higher prevalence in Mexican.
 9. Isenberg H. Diachronische Syntax und die logische Struktur einer Theorie des Sprachwandels. *Studia grammatica V.* Berlin. 1965;5:133-168.
 10. Hallberg MC. Projecting the size distribution of agricultural firms—An application of a Markov process with non-stationary transition probabilities. *American Journal of Agricultural Economics.* 1969 May;51(2):289-302.
 11. Jelliffe DB. Recent developments in breastfeeding. *Med. J. Malaysia.* 1986 Mar 1;41(1).
 12. James LR, Joyce WF, Slocum Jr JW. Comment: Organizations do not cognize. *Academy of management review.* 1988 Jan 1;13(1):129-132.