FACTORS INFLUENCING THE WORKING EFFICIENCY OF WOMEN ENGAGED IN STONE BREAKING WITH SPECIAL REFERENCE TO NUTRITIONAL STATUS

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled **Factors influencing the working efficiency of women engaged in stonebreaking with special reference to nutritional status** is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree diploma, associateship, fellowship or other simi ar title of any other university or society

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CERTIFICATE

Certified that this thesis entitled **Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status** , is a record of research work done independently by Kum JYOTHI AUGUSTINE under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her

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INTRODUCTION

INTRODUCTION

One half of our country s human resources lies in the women wealth, which is about 50 per cent of our population Most of the women are concerned with production, processing, storage, sales, purchase and preparation of food and hence their role in the improvement of the nutrition of the family and community is significant (Devadas and Sithalakshmy, 1982) In recent years women have made the transition from wives and mothers to participants of the work force, taking themselves away from their homes and have become an economic force of the family This entry of the women in the labour force is a survival strategy especially in poor households

In India, working women constitute 12 per cent of the population (Ramachandran, 1986) According to the National Community of Self Employed Women (1992), 94 per cent of the total female work force operate within the highly exploited informal sector, characterised by low wage earnings, long hours of work, low productivity low skills, lack of security with limited legal safeguards

Omari (1991) observed that the rural women enter into the informal sectors, hoping that the profit they make will alleviate the economic hardships most families are facing and by doing so, women have displayed their independence from male domination and have gained leading roles in the household economy, keeping abreast of their burden of other household activities

Reports indicate that heavy schedule of work of rural women as wage earners and as housewives leads to complete physical exhaustion and reduced working efficiency Studies conducted in the different parts of the country also reveal that the working efficiency of an individual vary inversely in relation to the degree of undernutrition or energy stress

Taking into account the productive roles of women workers, their economic contribution to the family and community and the health hazards they face during their work, there is a need, to provide a package deal of services including food, health and improvement in the living and working conditions

Although a few studies have been carried out on the working efficiency with respect to nutritional status, data pertaining to the women engaged in strenuous occupations with reference to Kerala conditions are lacking

Hence the present study was proposed with the following objectives

1 To find out the relationship between nutritional status and working efficiency of women engaged in stone breaking

2 The factors influencing their working efficiency and determining their nutritional status and work output

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Literature pertaining to the study entitled **Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status** are reviewed under the following titles

1 Women in work force

2 Interrelationship between nutritional status and working efficiency

3 Effect of body size, composition and body weight on working efficiency

4 Diet and working efficiency

5 Working efficiency in relation to energy balance

6 Anaemia and working efficiency

7 Non-nutritional factors affecting the working efficiency

1 Women in work force

India s working women contribute about 89 per cent in the informal labour sector (Arunachalam 1985) Mukherjee (1992) found that employment in the informal sector is strenuous and it provides low returns Rani and Rajaiah (1988) have reported that female work participation rate is high for low paid work Sidhu *et al* (1987) revealed that female labour participation results in the improvement in social activities According to Sheela Rani (1993) hard labour, low wages and uncertainity in employment characterise the working condition of women quarry workers ILO(1988) has revealed that rural women shoulder a disproportionate share of poverty burden in many countries due to their low wages and working condition Kalaimathy (1990) has reported that lack of comprehensive employment legislation, discrimination, wage structure and lack of job security are the problems of rural women workers Sundhari (1990) showed that the position of Indian women is characterised by arduous working condition and low wages Chitnis (1983) observed that wage discrimination is partly legitimised on the basis of the argument that the work output of women is lower than that of men at the same task and the work done by women is classified as lighter or less skilled than the work done by men and consequently, women

are paid less Rao (1987) has observed that outside employment taken up by the women results in the negligence of their own health and leads to various nutritional problems

2 Interrelationship between nutritional status and working efficiency

According to Simopoulos (1982) nutritional status refers to the state of nutriture of an individual or a specific group Kamath (1986) defined nutritional status as the state of health enjoyed as a result of nutrition American Dietetic Association (1968) defined nutritional status as the state of health of an individual as influenced by the intake of essential nutrients On the other hand working efficiency is defined as the potential of an individual to engage in activity involving muscle action (Devadas, 1988) International Dietary Energy consultancy Group (1987) explained working efficiency or physical working capacity as the ability to perform maximal physical work

Wheeler and Tan (1983) stated that nutritional status of an individual has direct and identifiable effect on his or her productivity at work Spurr (1977) has reported that productivity among sugar cane cutters is

positively influenced by indicators of nutritional status and physical work capacity He has reported that the maximal oxygen consumption (Vo_2 max) which is a measure of work capacity, exhibits a strong direct relation with nutritional status Devadas (1988) stated that productivity of work force, that is work capacity or work productivity depends on the quality and quantity of nutrient intake

Devadas (1988) found that chronic malnutrition leads to low productivity among labourers in developing countries Satyanarayana (1979) has found that reduced work output of industrial workers is due to early malnutrition Eiser (1986) has observed inverse relationship between working efficiency and degree of malnutrition Edmunson (1977) has also supported the same Satyanarayana (1988) has found that chronically undernourished adolescents have significantly low work capacity

Shetty (1987) has reported that reduced physical capacity seen in undernourished adults is largely due to reduced body size which is the result of various degrees of malnutrition during the active growth of an individual Satyanarayana (1988) has revealed that poorly nourished young men could never compete with normally nourished counterparts either for work capacity or for wages earned Latham (1976) has stated that improved nutrition can have a

favourable effect on both the per capita income and quality of life, through increased work, whereas poor nutrition appears to restrain productivity in terms of output per unit of input He has also reported that the productivity of labour force in developing countries is generally low due to their poor physique resulting from chronic malnutrition

3 Effect of Body Size, Composition and Body Weight on Working Efficiency

Devadas (1988) found that all categories of individuals engaged in wage earning should possess good physique to optimise their performance Haddad (1991) has the opinion that small body size does have functional implications in adults in terms of work productivity and work capacity

Satyanarayana (1988) reported that men and women with better physical measurements earned 30 to 50 per cent additional incentive money in factories, where individual incentive system based on output was in operation

Jackson (1966) viewed that, since adult nutritional anthropometry was markedly influenced by adverse nutritional background during early childhood and adolescence, nutritional status, through its effect on body size, influences both the working and earning capacities

Spurr *et al* (1986) viewed that nutritionally deprived individuals had smaller body size and body weight and they expend energy proportionate to their body weight) Satyanarayana *et al* (1980) reports that boys, who are shorter and lighter have lower work capacity

Shetty (1988) has stated that short stature and reduced body size due to undernutrition will mean lower levels of productivity for sustained moderate to heavy physical work

Satyanarayana *et al* (1979) has reported that body weight for age is the most important factor which influences the work capacity, accounting for 64 per cent of variation between individuals, whereas height accounts only for 19 per cent of variation Low body weight subjects are reported to have significantly higher heart rates for a given work load as compared to their heavier counterparts, indicating that they have either low cardiopulmonary capacity or that the capacity of their muscle to extract oxygen is lowered (Sathyanarayana *et al* 1979)

Flores *et al* (1984) has reported that physical work capacity is significantly affected by fat-free body mass Chesher (1979) found that work output among Kenyan road workers positively related to arm circumference, which is an indicator of muscle mass

Crowdy and Vogel (1973) found that obesity reduced physical fitness and their work capacity in the British Army Wilson and Wilson (1969) has the opinion that work capacity and the respiratory function are found to be lowered in the obese population Satyanarayana (1977) indicated that the total daily work output directly related to body weight or lean body weight in the absence of obesity in men In women workers work output increased with body weight until a point of obesity is reached, after which it fall off sharply

4. Diet and Working Efficiency.

According to Satyanarayana *et al* (1979) nutrition and food intake are closely related to the efficiency and productivity of work Prema Kumari *et al* (1986) found that low food intake reduces the physical capacity to do work and increases the extent of fatigue, accident rate, sickness and absenteeism According to Satyanarayana (1979) lack of adequate food for prolonged period results in lethargy and reduces the physical endurance Agarwal (1983) pointed out that insufficiency of food intake adversely affects the working efficiency Dickie (1982) has the opinion that omitting breakfast is detrimental to work performance Swaminathan (1986) found that high carbohydrate diet proved better than high fat diet for workers

Hussain (1986) has opined that poor quality of diet and poor nutrition results in poor resistance to infection and greater incidents of diseases, whereas good nutrition and health prevents infirmity, absenteeism owing to disease and increased ability for sustained work Niranjan Reddy and Sudharani (1990) also supports the same view

Increased food availability for work force could result in desirable changes in work behaviour (Viteri, 1980) Swaminathan (1986) observed that provision of food supplement to workers improved health and working efficiency and increased the rate of production He also observed that farmers whose diet was adequate in all nutrients maintained good health and worked for longer period Muscat and Berg (1971) have reported that an improvement in nutrition could have a continuing, current or maintenance effect on the productivity of the labour force

Satyanarayana et al (1972) viewed that improvement in the nutritional status through food supplementation alone will not result in increased productivity in coal miners, unless other operational constraints are removed

Spurr (1971) showed that better nourished guatemalan peasants were able to complete their assigned work in about half the time as compared to poorly nourished peasants who were receiving no supplements Providing additional calories to industrial workers resulted in improved work turnover in workers engaged in coal and steel production (Keller and Kraut, 1962) Spurr *et al* (1977) found that rate of production after the meal is higher than that before meal

5. Working Efficiency in Relation to Energy Balance

In a report published by ILO (1988) it is revealed that the poor working conditions of the rural population in developing countries are characterised by low calorie intake Devadas *et al* (1975) has reported that energy intake of the women engaged in manual work is found to be below the allowances recommended by ICMR Waterlow *et al* (1985) opined that the energy intake of the women engaged in agriculture is seasonal with a high intake and output in monsoon and harvest and a low intake and expenditure in summer

Edmunson (1990) viewed that the major problem of low energy intake is not only the endemic starvation or restricted economic productivity, but also results in

marginal reserves in the body which will not be sufficient to meet the additional stress Sujatha (1990) reported that the calorie intake of working women in unorganised sector met only 60 per cent of RDA in comparison with their energy need

According to Mohr (1970) with increased physical effort the percentual fulfilment of daily energy requirements fall significantly in both male and female industrial workers Bleiberg *et al* (1980) has reported that one of the reasons for the negative energy balance observed in female agriculturalists is the compulsion to spend long hours in heavy work in the fields

Shetty *et al* (1987) has reported that energy deficient labourers are able to accomplish a task by expending less energy Viteri (1971) found that Guatemalan adults who had past or existing energy deficiency had lower (Vo_2max) or aerobic capacity than subjects with no energy deficiency Flores *et al* (1984) observed that the energy cost of a standardised physical activity is significantly lower in chronic energy deficient labourers Kulkarni (1990) reported a significant reduction in the mechanical efficiency in chronic energy deficient subjects with the increased work load

Satyanarayana (1980) has reported that decreased muscle mass in chronic energy deficient subjects accounts for reduced work capacity Barac-Nieto *et al* (1978) discovered that chronic energy deficient adult males exhibited a significant reduction in Vo_2 max or maximal aerobic power, which progressively declined as the degree of severity of the energy deficiency increased Vijayalekshmi *et al* (1988) has found that the energy expenditure is reduced with an increase in haemoglobin level, thus conserving energy Satyanarayana *et al* (1991) observed that energy expenditure for the heavy works like breaking stones or shovelling on railway track ranged from 4 to 7 K cals per minute

6 Anaemia and Working Efficiency

Nutritional anaemia is characterised by inadequate erythropoisis and reduced haemoglobin concentration, which is due to inadequate supply of nutrients like iron, folic acid and vitamin B_{12} (Agarwal, 1991) According to Maeyer and Tegman (1985), iron depletion continues to be one of the major nutritional deficiency as observed all over the world, with a very high prevalence rate in India Kishwar (1988) states that anaemia is more prevalent among the women in our country

Dzorio (1984) noted that 230 million people in 3rd world suffer from nutritional anaemia and this mild or moderate anaemia impairs the well being, reduce the maximal work capacity and the work performance According to International Nutritional Anaemia consultancy Group (1977) nutritional anaemia in view of its high prevalence in developing countries assumes great importance as a factor that may limit physical work capacity (PWC) of individuals

Nutritional Reviews (1983) has reported that iron deficiency anaemia is a major concern in many developing countries, as severe anaemia is claimed to impair work capacity, learning ability and immune functions Vijayalekshmi and Selva Sundari (1983) viewed that nutritional deficiency anaemia prevalent among the young women, is found to interfere with working efficiency Studies conducted by Gardner *et al* (1977) indicated that subjects with lower haemoglobin concentration had a lower work capacity Basta *et al* (1974), Basta *et al* (1979), Edgerton *et al* (1979) have found that occupational activities such as the quantity of wet-latex collected in rubber plantations and the amount of the tea picked is found to be significantly lower in anaemic workers

Tandon *et al* (1975) has reported that, reduced levels of output observed for farm labourers are

significantly correlated with anaemia Rahmathullah (1983) found that severe anaemia decreases maximal and near - maximal works

Ghosh (1987) stated that anaemia has a profound effect on health, it lowers resistance to fatigue and disease and affects working capacity Viteri (1974) indicated that in healthy individual the maximum work performance will be reduced proportionate to the fall in the haemoglobin, and thus anaemia imposes economic limitations on people whose livelihood depends on physical work

According to Nair (1990) iron deficiency anaemia, apart from its other metabolic effects, including those on immuno-competence, impairs physical stamina and working efficiency Vijayalekshmi and Selva Sundari (1983) has stated that iron deficiency anaemia effects the physical work capacity by reducing availability of oxygen to the tissues, which inturn affect the cardiac output Bhatia (1987) found that anaemic children were to use higher heart rates than normal children for same level of work and had poor endurance capacity Seshadri (1984) indicated that the aerobic capacity is reduced in anaemic children which could lead to early fatigue Devadas *et al* (1988) has revealed that non anaemics expended less energy than anaemics for the same activity

Edgerton *et al* (1981) have reported that work tolerance is related to haemoglobin concentration irrespective of the adequacy of stored iron Ohira *et al* (1981) has found that subjects with low haemoglobin and high serum iron, work longer than those with low haemoglobin and low iron

According to Vijayalekshmi and Selvasundari (1983) iron supplementation is an effective way of combating anaemia and for increasing the work output of the population Nutrition Reviews (1983) also reported the same Seshadri (1984) found that iron supplementation not only raised the haemoglobin level but also the work performance Basta *et al* (1974) has reported that iron supplementation in addition to improved haemoglobin concentration, significantly improves the serum iron levels Gopaldas *et al* (1983) has reported that blood lactate level, is a sensitive parameter for evaluating the impact of iron supplementation on physical work capacity Devadas (1979) found a positive correlation between supplementation and work performance Ohira *et al* (1979) state that elevation of haemoglobin by iron treatment increases work capacity Seshadri (1988) observed a significant improvement in working time after iron therapy in serum deficient individuals

7 Non-Nutritional factors affecting the working efficiency

According to Gilmer (1961) and ILO (1963) age has a negative relationship with output of the workers Takagi *et al* (1972) revealed that old workers were generally less fit for work requiring high visual acuity Alekutty (1989) has reported that young people are found to be more in the stone quarries than the older people Gupta (1976) had reported that educational status of workers is positively and significantly associated with overall work performance Agarwal (1969) pointed out that work turnover is related to experience in the job Sing (1970) found that greater the experience of workers, the better is their job performance

Fleishman (1965) has found a positive relationship between experience and work performance of the workers According to Thyagarajan *et al* (1978) job security provides satisfaction and a sense of fulfilment for the women and hence they are able to do their work effectively Nair (1990) observed that lack of skills, greater vulnerability, lesser mobility and heavy responsibilities at home affected the rate of work of women in unorganised sector A report of the ILO (1969), Gupta (1976) and Mongia (1976) found a positive relationship between skills and productivity of work, among the workers

Gupta (1971) has revealed that environmental factors adversely effect the health, well being, efficiency and productivity of women at work Mukhopadhayaya (1987) has reported that monotonous working conditions in unsanitary environments with dust and toxic chemicals in occupations such as coir making, stone breaking etc affect health of women workers, and their work performance Ramachandran (1986) has opined that the dual stress and conflicting demands of works in and outside the home adversely affects the work performance of the women

MATERIALS AND METHODS

MATERIALS AND METHODS

An investigation was carried out to ascertain the **Factors influencing the working efficiency of women engaged in stone breaking with special reference to the nutritional status** The major objectives of the investigations were -

a) To find out the relationship between nutritional status and working efficiency of women engaged in stone breaking

b) To ascertain the factors influencing the working efficiency and to determine the nutritional status and work output

Area of the study

Vizhinjam Panchayat of Thiruvananthapuram District was selected for the study, where stone breaking was one of the major occupations of the women

Selection of Sample

100 women in the age group of 20 30 years, who were solely engaged in stone breaking as their main occupation were selected at random for the study

Women engaged in stone breaking

A sub sample of 10 women, were selected for indepth investigations

Plan of action

Plan of action of the present study comprised of

(i) Assessment of socio economic characteristics of the families engaged in stone breaking

(ii) A dietary survey of the respondents to get an idea about their food habits and food consumption pattern

(iii) Assessing the personal characteristics and work patterns of the respondents

(iv) Assessment of the nutritional status of the respondents by ascertaining

A The actual food intake through 24 hour dietary recall method

B The energy balance of the respondents

C Anthropometric measurements viz , weight, height mid-upper arm circumference and triceps skinfold thickness

D Clinical picture of the respondents along with recording the pulse rate and blood pressure with the help of qualified physician

E Determining biochemical parameters, viz ,

1 Estimation of haemoglobin among 100 respondents

A woman engaged in stone breaking

2 Detailed studies in venous blood of sub sample, of 10 women regarding

a) Serum Iron

b) Total Iron Binding Capacity (TIBC)

c) Packed Cell Volume (PCV)

Development of tools and conduct of the study

Interview method was used in the present study to collect the required information Interview method is reported to be the suitable way as it proceeds systematically and records the collected information quickly (Bass *et al* 1979) According to the views of Charles and Kahn (1968), during the interview, the investigator is expected to present each topic by means of specific questions, and care needs to be taken to continue the dialogue until sufficient information is gathered to satisfy the research objectives

(i) In order to elicit information regarding socio-economic background of the families, details regarding-religion, type of family, family size, number of adults and children in the families, educational and employment status of parents and the respondents, total monthly income of the families and sources of income etc were collected from the respondents Physical amenities available for the families

and the monthly expenditure pattern of the families were the other details collected Socio-economic characteristics of the hundred respondents were collected in the present study through suitably developed and pre-tested questionnaire Questionnaire is presented in Appendix I

(ii) Information regarding the monthly food expenditure pattern of the families, food habits, frequency of use of various foodstuffs and the meal frequencies of the respondents were collected while conducting survey on the food consumption pattern of the 100 families The questionnaire developed for the purpose was pretested before administration and is given in Appendix II

(iii) Details on personal characteristics and working pattern of the respondents collected for the study schedule included, age, experience in the job, income from the job, job satisfaction, convenience of worksite, working schedule of the respondents, work output, health hazards due to the work, workload extraneous to stone breaking and the time spent for the same The questionnaire developed for this purpose was pretested and is presented in Appendix III

Among the various factors mentioned above, many factors were related with working efficiency Mongia (1976) defined labour productivity as the rates of output to the

corresponding input of labour Padmanabhan (1981) defined labour efficiency as the capacity to do productive work on the farm per man per unit time In the present study, working efficiency was worked out, in terms of number of baskets of stone broken by the respondents per unit time

(iv) Research designed to determine the indicators of nutritional status enables effective screening programmes to identify the malnourished (Habicht *et al* 1982 ,Martorell *et al* 1980) According to Simopoulos (1982)nutritional status refers to the state of nutriture of an individual or a specific group

Techniques used for assessment of the nutritional status of the respondents in this study include actual food intake, energy balance, anthropometric assessment, clinical examination and bio chemical investigations

A Actual food intake

Dietary surveys constitute an essential part of any complete study of nutritional status of an individual, providing information on nutrient intake levels (Gopaldas and Seshadri, 1987) According to Visweswara Rao (1975) any single day or 2 day weighment method would be as efficient a tool as that of 7 days In the present study, 24 hour recall method was used for assessing the actual food intake of the respondents The schedule is presented in Appendix IV

In this method, the subjects or respondents were asked to report the raw ingredients of the food items used for the whole family in the previous 24 hours which was recorded in local volumetric measures or standard volumetric measures and later converted to grams or directly recorded in grams if possible The volume of cooked foods was also recorded The subjects consumption of the cooked foods were recorded in local or standard volumetric measures These were then converted to raw weight of foods in grams and the nutritive value calculated using the Food Tables (1991) The amount of each food stuff and the calculated values of nutrients were then compared with recommended dietary allowance of food (ICMR, 1981) and nutrients (ICMR, 1989) for adult women worker

B. Energy balance

In order to determine the energy balance, the energy expenditure and energy intake patterns of the respondents were determined Energy expenditure was determined using prediction equation as suggested by (ICMR, 1989) given in Appendix V Actual energy intake was determined by conducting one day recall dietary survey

C Anthropometric assessment

Nutritional anthropometry is recognised widely as an effective means of assessing nutritional status, especially at the level of the population The measurements

taken are used to assess either physical growth (a reflection of nutrient adequacy during development) (Tanner, 1976) or body composition (an indicator of the excess or deficit of energy or protein) (Frisancho, 1974) Anthropometry has been accepted as an important tool for the assessement of nutritional status (Vijayaraghavan, 1987) Weisell (1982) reported that anthropometric data are being used increasingly in estimating nutritional status Height and weight evaluated against age is used to indicate nutritional status (Mc Laren&Read, 1972)

Four anthropometric measurements viz , weight for age, height for age, mid-upper arm circumference and triceps skinfold thickness of the respondents were taken in the present study, to assess the nutritional status

(a) Weight for age

Weight is a measurement of body mass Comparison of weight for age value, with regional standards at corresponding age will help to determine the degree of undernutrition in a community According to Kaul and Issac (1990), a change in body weight may be the result of changes in the health of an individual, changes in dietary supplies or even changes in one s physical activity

For weighing, platform weighing balance was used, as it is portable and convenient to use in the field The weighing scale was checked periodically for accuracy The scale was adjusted to zero before each measurement The subject was having minimum clothing and was asked to stand on the platform of the scale, without touching anything, and looking straight ahead The weight was recorded to the nearest 0 25 Kg Each reading was taken twice to ensure correctness of the measurement

(b) Height for age

Height, or the total length, apart from nutritional and other environmental factors, is influenced by hereditary factors The extent of height deficit in relation to age, as compared to regional standards, may be regarded as a measure of the duration of malnutrition (Gopaldas and Seshadri, 1987)

To determine height, a measuring tape was fixed vertically on a smooth wall, perpendicular to the ground, taking care to see that the floor area was even and not rough The subject was asked to remove her slippers, stand with the centre of her back touching the scale with her feet parallel and heels, buttocks, shoulders and back of the head touching the wall The head was held comfortably erect, the

arms hanging loosely by the side A smooth, thin ruler was held on the top of the head in the centre, crushing the hair at right angle to the scale, and the height read off from the lower edge of the ruler to the nearest 0 5 cm Each reading was taken twice to ensure correctness of the measurement

Body Mass Index (BMI) expressed as the ratio of weight to height square ie (weight (kg)/Height^2(M)), can be used as a good parameter to grade Chronic Energy Deficiency (CED) in adults (Nutrition News, 1991) CED has been defined as a steady state in which a person is, in energy balance, although at a cost either in terms of risk to health or an impairment of function and health The BMI values between 18 5 and 25 are considered to be compatible with health for both men and women (James *et al* 1988) BMI values between 25 1 30 and above 30 are classified as obese grade I & II respectively (Garrow, 1987)

(c) Mid-upper arm circumference

Measurement of the mid-upper arm circumference is the most useful, practical method for assessing muscle mass, as this region is easily accessible and measurement requires only a flexible fibre glass tape (Gopaldas and Sheshadri, 1987)

Mid arm circumference was measured to the nearest 0 1 cm with a tape by placing gently but firmly round the limb to avoid compression of the soft tissues The left arm was measured while hanging, at its mid point

(d) Triceps skinfold thickness

Measurement of skinfold (or fatfold) at triceps is one of the methods for assessment of the amount of subcutaneous fat, which gives an indication of the calorie reserves in the body of an individual (Malina *et al* 1974)

Skinfold thickness was determined using a Langares calipers A lengthwise skinfold was firmly grasped and slightly lifted up between finger and thumb of left hand Care was taken not to include underlying muscle The calipers was applied about 1 cm below the operators finger at a depth about equal to the skinfold, while the skinfold was still gently held throughout the measurement The measurement was read to 0 1 mm accuracy and the results averaged

D Clinical Examination

Clinical examination is stated to be one of the most essential and the simplest tool used in the evaluation of human nutritional status (Gupta *et al* 1978) The

presence or absence of clinical deficiency symptoms which is an index of nutritional status, was assessed by a qualified physician The schedule used for the assessment is presented in Appendix VI

During the clinical examination the pulse rate and blood pressure of the respondents were also recorded, as these had some relation with working efficiency

1. Pulse rate

To assess the rate of heart beat (cardiac function) the radial pulse at the wrist is generally used (Swash and Mason, 1984) It is felt with the tips of the fingers, the patient s forearm being pronated and the wrist slightly flexed The number of beats per minute is stated as the pulse rate

2. Blood Pressure

Blood pressure is the clinical assessment used to measure the cardiac abnormalities It is measured using an instrument, the sphygmomanometer The method followed is presented in Appendix VII

E. Biochemical Investigations

Biochemical measurements represent the most objective assessment of the nutritional status of an individual, frequently providing pre or sub-clinical

information, (Sausberlich *et al* 1977) There are several biochemical indicators of malnutrition, specific for different nutritional deficiencies In most instances nutrient intakes are reflected in their levels present in blood/Serum/Urine (Gopaldas and Seshadri, 1987) The level of nutrients present in blood as reflected by the intake of dietary iron was estimated in the present study

Rajajee (1989) stated that estimation of haemoglobin, serum iron and Total Iron Binding Capacity (TIBC) of the serum are useful investigations to confirm the extent of iron deficiency Estimation of serum iron and iron binding capacity make possible to get clear picture of the iron balance of an individual (Mudaliar and Krishna Menon 1987)

1 Haemoglobin

Soof (1967) reported that the heamoglobin levels formed satisfactory indices, for detecting iron deficiency for survey purposes

Estimation of haemoglobin was done by the cyanmethaemoglobin method among the 100 respondents(Dacie *et al* 1975) The methods followed for the estimation of haemoglobin is given in Appendix VIII

2 **Serum Iron**

Extent of iron deficiency detected by the amount of serum iron present in blood was estimated using Wong s method The procedure is given in Appendix IX

3 **Total Iron Binding Capacity**

Estimation of the total quantity of iron in serum after the complete saturation of transferin is useful in finding out iron deficiency status in individuals In the present study total iron binding capacity was estimated in the serum and the procedure is given in Appendix X

4 **Pack Cell Volume (PCV) or Haematocrit %**

Haematocrit / or packed cell volume is the basic value revealing the degree of anaemia (Swash and Mason, 1984) Haematoorit values give the volume of red blood cells/packed cells present in 100 ml of blood, which is an index of anaemia Appendix XI give the detailed procedure

Interpretation of data collected

Suitable statistical techniques were used for interpreting the data collected Nutritional status index was worked out using various variables like height, weight, Body Mass Index (BMI), haemoglobin, clinical score and the intake of nutrients, viz , protein and energy Correlations and intercorrelations were worked out between nutritional status and working efficiency of the respondents

RESULTS

RESULTS

The results of the present study entitled **Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status** are presented under the following heads

I Socio-economic background of the families

II Food consumption pattern of the families including respondents

III Personal characteristics and work pattern of the respondents

IV Assessment of the nutritional status of the respondents

I. Socio-economic background of the families

Socio-economic background of the families were assessed with regard to religion, type and size of the families, educational and employment status of the family members and total monthly income

Table 1 depicts the religion and caste wise distribution of the families As summarised in the table 90 per cent of the families surveyed were Hindus and the

rest were christians None of them belonged to muslim community Among the families surveyed, 81 per cent belonged to backward caste and 19 per cent belonged to SC/ST None of them belonged to forward caste

Table 1

Religion and caste-wise distribution of the families

Religion	Percentage
Hindu	90
Christian	10
Total	100
Caste	**Percentage**
Forward	0
Backward	81
SC/ST	19
Total	100

Family size in relation to the type of family is presented in Table 2 Out of the 79 per cent nuclear families, 32 per cent were small sized with one to four members, while 47 per cent were big families having members five to ten Twenty one per cent families surveyed belonged to joint/extended type families all of which were bigger in family size The average family size of the families were found to be 5 8

Table 2

Distribution of the families according to the type and size of the families

Type of family	Percentage	Family size	
		Small family (1-4 member) (/)	Big family (5 10 members) (/)
Nuclear	79	32	47
Joint/Extended	21	0	21
Total	100	32	68

The number of adults and children in the families in relation to the family size is represented in Table 3 Among the small sized families, 63 per cent families were found to have 1 or 2 adult members while 37 per cent families were with 3 4 adults members On the other hand 1or2 numbers of children were found in 47 per cent families while in 53 per cent of the families there were no small children None of the families were found to have more than two small children Out of the big sized families, 49 per cent families had 3-4 adult members, 41 per cent families, had more than 4 adult members and 10 per cent families, had 1-2 adult members Among the big sized families,68 per cent

families had 1or2 numbers of children while 21 per cent families had 3or4 numbers of children and 11 per cent families were found to have 4 or more childern

Table 3

Adult and child population of the families in relation with family size

Family size	Number of adults				Number of children				
Range	1 2	3 4	above	Total	1 2	3 4	above 4	Nil	Total
Small family	63 0	37	0	100	47	0	0	53	100
(1-4 members)	(20)	(12)		(32)	(15)			(17)	(32)
Big family	10	49	41	100	68	21	11	0	100
upto 10 members	(7)	(33)	(28)	(68)	(46)	(14)	(8)		(68)

Figures in parenthesis indicate numbers

Educational status of the parents as well as that of respondents are presented in Table 4 Of the families surveyed, 18 per cent of the respondents fathers were found to be illiterates ie , not having any formal education Seventy two per cent of them attained primary level education Seven per cent and three per cent respectively

attained upper primary and high school level education Ten per cent of the respondents mothers were found to be illiterates Eighty one per cent had primary level of education and 9 per cent had attained upper primary level of education

Table 4

Distribution of the parents and the respondents with regard to educational status

Education	Father (%)	Mother (%)	Respondent (%)
Illiterate	18	10	5
Primary	72	81	51
Upper Primary	7	9	19
High School	3	0	13
College	0	0	2
Total	100	100	100

Educational attainment of the respondents indicated that only 5 per cent of them were illiterates Fifty one per cent had got primary level education, while 19 per cent of respondents had attained upper primary level education High School level education was obtained by 13

per cent and 2 per cent of them had undergone college level education On enquiry about respondents current educational status, it was found that none of them were undergoing education at the time of survey

Table 5 depicts the employment status of the parents and that of the respondents As revealed in the table 5 , 61 per cent of the respondents fathers and 43 per cent of respondents mothers were found to be unemployed Eight per cent of respondents fathers were engaged in stone breaking in contrast to 39 per cent of respondents mothers Twenty and eighteen per cent respectively of respondents fathers and respondents mothers were casual labourers None of the respondents mothers were engaged in Government jobs or private jobs, in contrast to 3 per cent and 8 per cent respectively of the respondents fathers All the respondents surveyed were found to be engaged solely in stone breaking

Table 5

Distribution of the respondents parents with reference to the employment status

Employment	Father (/)	Mothers (/)
Not employed	61	43
Stone breaking	8	39
Coolie	20	18
Govt job	3	0
Private job	8	0
Total	100	100

Monthly income of the families, which is a measure of the economic position of the families indicated that 76 per cent of the families had a total monthly income ranging from Rs 500/- to Rs 1000/ and 24 per cent had income below Rs 500/- Per capita income of these families were worked out and is shown in Table 6 In 45 per cent families, per capita income was in the range of Rs 100/- to Rs 200/-, whereas in 37 per cent families per capita income was below Rs 100/- Eighteen per cent families were found to have per capita income above Rs 200/-

Table 6

Per capita income of the families

Monthly Per capita income (Rs)	Percentage
Below 100	37
100 - 200	45
Above 200	18
Total	100

Various sources of income of the families surveyed are depicted in Table 7 In 46 per cent families income contributed from stone breaking was 25-50/, whereas in 28 and 26 per cent families income contributed from stone breaking was 51-75 per cent and 76-100 per cent respectively Occupations like casual labour/ coir making had contributed 26-50 per cent of the income for 46 per cent families and in 22 per cent families 51 75 per cent of the income was obtained from the same source The income contributed from agriculture in majority of the families was negligible

Table 7

Sources of income in percentage of total monthly income

Percentage of total income	Sources of income		
	Stone breaking (/)	Other occupation Casual labour/ coir making (/)	Agriculture/ land (/)
Less than 25	0	6	17
25 50	46	46	10
51 75	28	22	0
76 100	26	0	0
Nil	0	26	73
Total	100	100	100

Physical amenities available for the families with respect to their family income including the ownership of a house, drinking water, drainage, lavatory and electricity facilities are given in Table 8 Ninety two per cent families with total monthly income below Rs 500/- owned houses near their work site For 96 per cent families public tap facilities were available for drinking water Only very few families with income below Rs 500/- (8 per cent, 4 per cent and 29 per cent respectively) were found to have facilities such as drainage, lavatory and electricity But in families with higher income (above Rs 500/-), 95 per

cent of them owned a house and 91 per cent have public tap facilities near their houses Drainage, lavatory and electricity facilities were found to be enjoyed by 12 per cent, 4 per cent and 25 per cent families respectively in this income category

Table 8

Physical amenities available for families in relation to their total monthly income

Monthly Income (Rs)	Total	Own house		Drinking water		Drainage		Lavatory		Electricity	
		Yes	No	Well	Pipe nearby	Yes	No	Yes	No	Yes	No
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Below 500	100 (24)	92 (22)	8 (2)	4 (1)	96 (23)	8 (2)	92 (22)	4 (1)	96 (23)	29 (7)	71 (17)
(500 1000)	100 (76)	95 (72)	5 (4)	9 (7)	91 (69)	12 (9)	88 (67)	14 (11)	86 (65)	25 (19)	75 (57)

Figures in paranthesis indicate numbers

Various communication sources for the respondents included newspapers, magazines/weeklies, television and radio A score ranging 0 3 was assigned for each media based on their regularity of exposure to each media Thus the maximum score attainable by an individual who has daily exposure to all the four media is 12

Based on the scores obtained, respondents were classified into three groups viz , high exposure group (scores 10 to 12), medium exposure group (scores 7-9) and low exposure group (scores below 7) and, the results are given in Table 9

It is obvious from the table that, 50 per cent respondents were having low exposure to mass media, while 31 per cent of them have medium exposure and only 19 per cent have high exposure

Table 9

Frequency distribution of respondents according to exposure to mass media

Frequency of exposure	Percentage
Low exposure (below 7)	50
Medium exposure (7 9)	91
High exposure (10 12)	19
Total	100

On observing monthly expenditure patterns of the families in percentage of their total monthly income Table 10(a & b) it was found that about 74 per cent of the families spent above 75 per cent of their monthly income on food items and 26 per cent of them spent 50-75 per cent of their income for food Regarding expenditure incurred for health,

ce e ajority of the families (92 per cent, 99 per cent and 98 per cent), spent nearly 5 per cent of their income for clothing, transportation and cosmetics respectively Only 6 per cent families spent about 5 per cent of their income for rent None of the families were found to have debts For recreation, personal expenses, luxury items etc, majority of the families (75,79 and 71 per cent) did not incur any expenditure

Table 10

(a) Expenditure pattern on food items

Percentage of income	Percentage
Food items	
50 - 75	26
Above 75	74

(b) Expenditure on non food items

In percentage of income	Non food items								
	Clothing (%)	Rent (%)	Transport (%)	Education (%)	Health (%)	Recreation (%)	Personal expenses (%)	Cosmetics (%)	Ornaments (%)
Nil		94		39		75	79		71
0 5	92	6	99	59	55	25	21	98	24
6 10	4		1	2	39			2	5
11 20	4				6				
Total	100	100	100	100	100	100	100	100	100

Food consumption pattern of the families and the respondents

Food consumption pattern of the families was assessed with regard to their dietary practice, expenditure pattern on food items, frequency of use of various food items and meal frequencies followed in the families The results obtained are presented in the Tables 11-15

Eating Habits prevalent among the families under study including respondents showed that all of them were non vegetarians

Table 11 presents the food expenditure pattern of the families on different foodstuffs, in percentage of their total monthly income As revealed in the table, 83 per cent of the families spent 26-50 per cent of their income for cereals, mainly for rice, while 14 per cent of the families spent only 1-25 per cent of their income for the purchase of cereals Seventy nine per cent families incur 1-10 per cent of their income for pulses, while 21 per cent did not spend any money for the purchase of pulses Majority of the families (90 per cent) spent about 1-10 per cent of their income for vegetables For green leafy vegetables about 60 per cent families did not spend any money Fifty eight per cent families spent about 1-5 per cent of the income for

roots and tubers while 40 per cent families spent about 6-10 per cent for the same The expenditure for egg and bakery items for 95 per cent and 91 per cent families respectively were found to be negligible None of the families spent any money for purchasing meat Fifty one per cent families spent below 5 per cent of their income for fruits, whereas 49 per cent families never expended money for fruits Eighty two per cent spent about 11-20 per cent of their income forfishand 16 per cent spent 1-10 per cent of their income for buying fish For purchasing fats and oils and spices and condiments 68 per cent and 67 per cent families respectively spent 6 10 per cent of their income The expenditure on sugar and jaggery ranged from 1-5 per cent for 55 per cent families and 6-10 per cent for 41 per cent families

Table 11

on pattern of the families in percentage
ncome

	Food stuffs	/	Percentage income spent
1	Cereals	14	1-25
		83	26 50
		3	51-75
2	Pulses	79	1 10
		21	Nil
3	Green leafy vegetables	40	1 5
		60	Nil
4	Other vegetables	90	1-10
		10	11 20
5	Roots and tubers	58	1-5
		40	6 10
		2	11-15
6	Fruits	51	1-5
		49	Nil
7	Egg	5	1-10
		95	Nil
8	Meat	100	Nil
9	Fish	16	1 10
		82	11 20
		2	21-30
10	Fats and oils	23	1-5
		68	6-10
		9	11-15
11	Sugar and jaggery	51	1-5
		41	6 10
		4	11-15
12	Spices and condiments	25	1 5
		67	6-10
		8	11-15
13	Bakery items	9	1-5
		91	Nil

Table 12 pertains to the frequency of use of various food items by the respondents

As it may be seen from Table 12 the food items like cereals and spices and condiments were consumed daily by all the respondents Ninety six per cent of the families used sugar and jaggery, 89 per cent used fats and oils and 88 per cent used fish and 80 per rent were found to use milk in their daily diets Consumption of pulses by 42 per cent respordents were occasional, whereas consumption was only once in a week for 32 per cent respondents Vegetables were used by 53 per cent respondents daily Majority (64 per cent) of the respondents surveyed included green leafy vegetables in the dietaries occasionally Forty per cent respondents consumed roots and tubers once in a week, while 62 per cent of the respondents included fruits occasionally in their dietaries Protein rich foods like meat and egg were never used by 74 per cent and 78 per cent respondents respectively Bakery items was found to be least used by majority (80 per cent) of the respondents Based on the frequency of use of various food items by the respondents, food use frequency scores were calculated as suggested by Reaburn *et al* (1979) and the formula is given below

/

Percentage of total score $\frac{R_1S_1 + R_2S_2 + RnSn}{n}$

Sn Scale of rating

Rn Percentage of respondents selecting a rating

n Maximum scale rating

Table 12

Frequency of use of different foodstuffs by the respondents

Food stuffs	Daily (%)	Thrice in a week (%)	Twice in a week (%)	Once in a week (%)	Occasionally (%)	Never (%)	Total (%)
Cereals	100						100
Pulses			11	32	42	15	100
Other Vegetables	53	23	13	9	2		100
Green leafy vegetables			10	26	64		100
Roots and tubers	7	20	27	40	6		100
Fruits			6	32	62		100
Milk	80				20		100
Fish	88	10	2				100
Meat					26	74	100
Egg					22	78	100
Fats and oils	89	11					100
Sugar and jaggery	96	4					100
Spices and condiments	100						100
Bakery items					20	80	100

Table 13 depicts the average food frequency scores and percentage of total scores obtained for each food group Percentage food frequency score of 100 was obtained for by food items like cereals, spices and condiments and sugar and jaggery A percentage score of 98, 100 and 98 respectively, was obtained for foodstuffs like fish, sugar and jaggery and for fats and oils respectively The percentage scores for both milk and other vegetables was 84, whereas for roots and tubers score was 56 Foodstuffs like pulses, green leafy vegetables and fruits scored 28, 30 and 29 respectively Very low percentage scores (5 4 & 4 0) was obtained for foodstuffs like meat, egg and bakery items

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Table13

Food frequency scores obtained by the respondents for various food groups

Food items	Average scores	/ of total Scores
Cereals	5	100
Pulses	1 4	28
Green leafy vegetables	1 5	30
Other vegetables	4 2	84
Roots and tubers	2 8	56
Milk	4 2	84
Meat	0 25	5
Egg	0 2	4
Fish	4 9	98
Sugar and jaggery	5	100
Fats and oils	4 9	98
Spices and condiments	5	100
Bakery items	0 2	4
Fruits	1 45	29

Based on the percentage frequency score, food groups included in the daily dietaries by respondents were classified as most frequently used foods (/ scores above 80), medium frequently (/ score 50-80) and less frequently used foods (/ scores below 50)

From the table 14, it is revealed that cereals vegetables, milk, fish, fats and oils, sugar and jaggery and spices were the food groups most frequently used by the families surveyed Roots and tubers was found to be medium frequently used and pulses, green leafy vegetables, fruits, meat, egg and bakery items were food items less frequently by the respondents

Table 14

Frequency of use of food groups by the respondents

Most frequently used foods	Medium frequently used foods	Less frequently used foods
Cereals	Roots and tubers	Pulses
Vegetables		Green leafy vegetables
Milk		Fruits
Fish		Meat
Fats and oils		Egg
Sugar and jaggery		Bakery items
Spices and condiments		

On assessing the meal frequency of the families it was found that three meal pattern viz , breakfast, lunch and Dinner was followed in majority (52 per cent) of the families surveyed Forty per cent of families followed a four meal pattern and only 8 per cent followed 2 meal pattern viz , (lunch and dinner) as evident from Table 15

Table 15

Meal frequency followed by the respondents

Meal frequency	Percentage
Two	8
Three	52
Four	40
Total	100

Majority (90 per cent) of the families were not in the habit of cultivating any food articles at home due to lack of space and time However 10 per cent families were found to use coconut from their own lands

Personal characteristics and work pattern of the respondents

Personal characteristics such as age, experience, number of members engaged in stone breaking, monthly income from stone breaking and job satisfaction were collected from the respondents Working pattern, work output, resting hours and food intake in between the work, health hazard faced by the women and household responsibilities entrusted were the other details collected from the respondents

The results obtained are presented from Tables 16 to 25

As indicated in Table 16, 70 per cent of the respondents were in the age group of 26 30 years Experience of the respondents in the present job indicated that 59 per cent of them were found to have experience above 4 years, while 25 per cent had an experience of 2 4 years Sixteen per cent respondents were found to have entered in this profession recently, with less than 2 years of experience

Table 16

Distribution of respondents in relation to age and experience

Age (Years)	Percentage
20-25	70
26 30	30
Experience in stone breaking (Years)	**Percentage**
Below 2	16
2-4	25
Above 4	59

The reason for selecting stone breaking as their occupation, was mainly due to their economic disability and there being no other alternative

In 25 per cent of the families, one member was found to be engaged in stone breaking and in 47 per cent families 2 members were engaged in this occupation More than 2 members were found to be engaged in stone breaking in 28 per cent families as shown in Table 17

Table 17

Members engaged in stone breaking

Number of Members	Percentage
One	25
Two	47
Three	12
Four	13
All members	3
Total	100

Income earned by the respondents through stone breaking is given in Table 18 Forty eight per cent of the respondents were found to be earning an income ranging from Rs 301/ to Rs 400/- while 38 per cent earned Rs 201/- 300/- per month

The respondents earning Rs 200/- or below and above Rs 400/- per month were found to be 10 and 4 per cent respectively It was observed that the money thus earned by the respondents were used mainly for meeting the family needs in 85 per cent of the respondents, while 15 per cent used this money for buying cosmetics and other personal things

Table 18

Monthly income earned by the respondents from stone breaking

Income (Rs)	Percentage
100-200	10
201-300	38
301 400	48
401-500	4
Total	100

Seventy eight per cent of the respondents viewed that income from the job was not sufficient to meet their family requirement, whereas 12 per cent felt that income from their job almost met their family needs

With regard to job satisfaction of the respondents, 77 per cent of them were not found to be satisfied with their present job Reasons given by the respondents for their dissatisfaction were, deterioration in their health (68 per cent), meagre wages (22 per cent) and heavy workload (10 per cent)

On enquiring about the convenience of work site it was found that for 76 per cent, the work site was within half a kilometer and for the remaining 24 per cent the distance was between half to one km It was also observed that all the respondents reached the work site by walking, as their houses were near the work site

On assessing the work schedule of the respondents, it was found that 56 per cent of the respondents started their work between 7 30 to 8 A M , and 11 per cent started late by 9 A M as shown in the Table 19 Fifty seven per cent respondents were found to work till 3 30 - 4 30 P M while43 per cent worked till 5 00 6 00 P M

Table 19

Working schedule followed by the respondents

Starting time (Range)	Percentage
From 7 00 AM	33
7 30 - 8 00 AM	56
9 AM	11
Total	100
Ending time (Range)	**Percentage**
3 30 - 4 00 P M	57
5 00 6 00 P M	43
Total	100

On assessing the average time spent by the respondents per day in stone breaking, 44 per cent of them engaged approximately for 8 hours, while 30 per cent of them

engaged around 7 hours Sixteen per cent worked for 6 hours, while 6 per cent worked below 6 hours and 4 per cent for 9 hours asrevealed in Table 20

Table 20

Time spent by the respondents in stone breaking per day

Time (hours)	Percentage
Below six	6
Six	16
Seven	30
Eight	44
Nine	4
Total	100

Table 21 presents the number of days spent by the respondent in stone breaking per week Fifty three per cent of the respondent worked for 6 days, 42 per cent worked for all the 7 days only 5 per cent was found to work for 5 days in a week

Table 21

Days spent by the respondents in stone breaking per week

Number of days	Percentage
Five	5
Six	53
Everyday	42
Total	100

Table 22 reveals the quantity of stone broken by the respondents per day Wages were paid to the respondents based on the quantity of stone broken Seventy four per cent of the respondents were found to break>3 baskets of stone per day, wheréas 20 per cent break 3 baskets per day and 6 per cent respondents were found to break 2 baskets per day

Table 22

Quantity of stone broken by the respondents per day

Number of baskets	Percentage
Two	6
Three	20
Above three	74
Total	100

Work was performed more efficiently by taking rest in between the works Hence the resting pattern of the respondents were enquired and the results are given in Table 23 Sixty one per cent of the respondents were found to take half an hour rest between the work in a day, while 35 per cent were found to avail one hour rest and only negligible per cent respondents (4 per cent) were found to take more than one hour rest in between the works

Table 23

Resting time of the respondents during work

Time	Percentage
Half an hour	61
One hour	35
Above one hour	4
Total	100

The habit of taking food during the work hours among the respondents was enquired and it was revealed from Table 24 that majority were not in the habit of taking food in between during the work However 12 per cent of the respondents used to take tea from the nearby shops, as they felt that it give stimulation for better work performance, while another 12 per cent was in the habit of taking gruel carried by them during the work Only 3 per cent were found to take lime juice during works

Table 24

Habit of taking food by the respondents

Food items	Percentage
Kanji (gruel)	12
Coffee/tea	12
Lime juice	3
Nil	73
Total	100

All the respondents were found to seek assistance in loading, unloading and also in breaking large stones into smaller ones, either by paid coolies or by their own relatives

The respondents were found to take leave in the job seldom, that also on such occasions like sickness of the family members, unexpected guests, death, festive ceremonies etc

The major constraints faced by these women was the scarcity of stones 19 per cent respondents managed to get loans for purchasing the stones Health problems, lack of money, insufficient wages and risk factors are the other constraints felt by 90 per cent of the respondents

The health problems due to stone breaking arose from cuts and wounds on the hands, stone pieces fallen in the eyes etc About 85 per cent of the respondents reported that they become sick quite often due to fever, anaemia headache chest pain etc

The general opinion about the work of the respondents indicated that 76 per cent of them had negative attitude towards this job while 24 per cent responded positively

As far as the other tasks are concerned, it was found that 95 per cent of them had to attend the household works in addition to stone breaking The time spent by the respondents in performing the household tasks (Table 25) indicates that 67 per cent of them spent one to two hours for household tasks only 13 per cent of them spent more than 3 hours per day for house hold works

Table 25

Time spent by the respondents for household tasks

Time (hours)	Percentage
One	34
Two	33
Three	20
Above three	13
Total	100

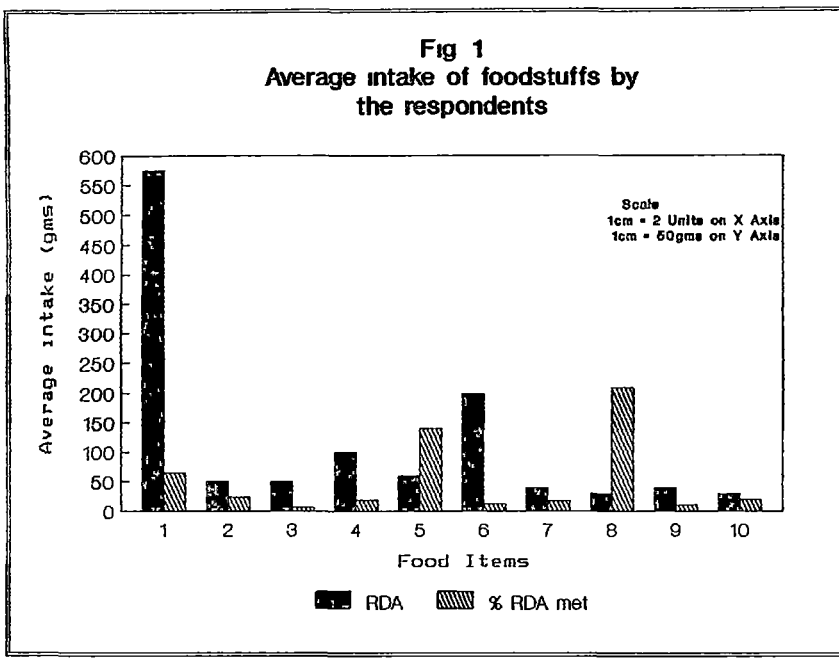
Assessment of Nutritional status of the respondents

A Actual food intake of the respondents

The dietary intake of all the respondents was assessed by 24 hour dietary recall method This survey enables to analyse the quality and quantity of foods consumed by an individual and to locate their adequacy and inadequacy Their diets were compared with the Recommended Dietary Allowances (RDAs) of ICMR (1981)

(1) Actual Food Intake

The actual quantity of food intake of the respondents determined in comparison with the suggested Recommended Dietary Allowance are presented in Table 26 (Fig 1) Among the various food items consumed by the respondents, the intake of roots and tubers and fish were met 140 and 210 per cent respectively of RDA The percentage of RDA met by the consumption of cereals was about 65 whereas consumption of pulses and fruits met 24 and 20 per cent respectively of the RDA Consumption of other v getables, green leafy vegetables and milk met 19, 6 and 13 per cent of RDA Percentage RDA met by sugar and jaggery and fats and oils were 10 and 18 respectively



Food items

1	Cereals	6	Milk
2	Pulses	7	Fats and oils
3	Green leafy veg	8	Fish
4	Other vegetables	9	Sugar and jaggery
5	Roots and tubers	10	Fruits

Table 26

Average quantity of food stuffs consumed by the respondents

Food items	RDA (gms)	Average quantity consumed (gms)	Percentage of RDA met
Cereals	575	374	65
Pulses	50	12	24
Green leafy vegetables	50	3	6
Other vegetables	100	19	19
Roots and tubers	60	84	140
Milk	200	25	13
Fats and oils	40	7	18
Fish	30	63	210
Sugar and jaggery	40	4	10
Fruits	30	6	20

ICMR 1981

(2) Mean Nutrient intake of the respondents

The nutrient intake of the respondents were computed from the quantity of foods consumed by the respondents and are presented in Table 27

The table shows that the intake of energy was 56 per cent of RDA, whereas protein was met about 96 per cent The

percentage of RDA met by the respondents for iron, calcium, retinol and Vitamin C was 50 97, 43 and 68 respectively, whereas B complex Vitamins viz , thiamine, riboflavin and niacin met 92, 40 and 4 per cent respectively

Table 27

Mean nutrient intake of the respondents

Nutrients	RDA	Nutrient intake	Percentage of RDA met
Energy (k cals)	2925	1647	56
Protein (gms)	50	48	96
Iron (mg)	30	15	50
Calcium (mg)	400	389	97
Retinol (mg)	600	259	43
Thiamine (mg)	1 2	1 1	92
Riboflavin (mg)	1 5	0 6	40
Niacin (mg)	16 0	15	94
Vitamin C (mg)	40	27	68

ICMR 1989

B Energy balance of the respondents

The energy balance of an individual is the level of energy intake from food that will balance energy expenditure when the individual has a body size and composition and level of physical activity consistent with long term good health and that will allow for maintenance of economically necessary and socially desirable activity Energy expenditure of the respondents were worked out using the prediction equation (I C M R 1989) details of which are presented in Appendix (V)

Table 28 (Fig 2) depicts the average energy expenditure/energy intakes of the respondents in relation to their age The energy expenditure of all the respondents was considerably high about 2327 5 K cals whereas the average energy intake was alarmingly low ie 1619 6 K cals From the above table it is obvious that all the respondents were found to be deficient in energy intake in relation to their energy expenditure, the percentage of deficit being 29 5 to 60 7

Fig 2

Average energy expenditure in relation to the energy intake of the respondents

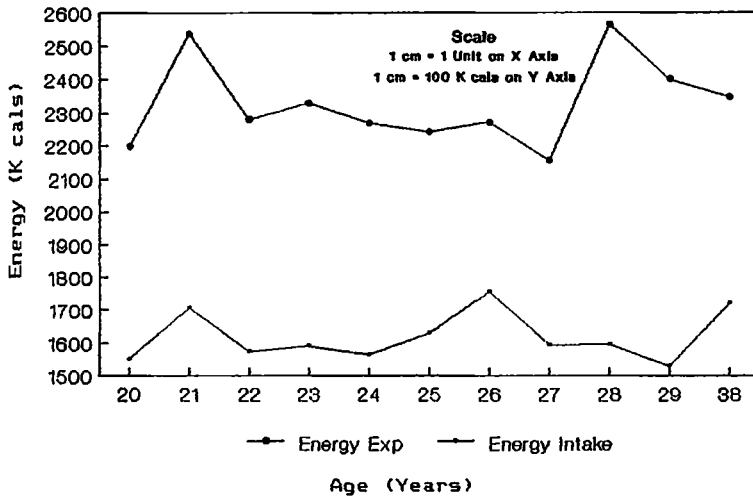


Table 28

Energy balance of the respondents

Sl No	Age (yrs)	Sample size	Energy e penditure (K cals)	Energy intake (K cals)	Percentage deficit
1	20	25	2197 99	1552 35	41 59
2	21	7	2537 40	1706 68	48 67
3	22	10	2279 17	1574 12	44 79
4	23	7	2331 00	1590 64	46 54
5	24	7	2270 10	1565 24	45 03
6	25	13	2243 12	1630 04	37 61
7	26	3	2272 90	1755 02	29 51
8	27	3	2155 30	1595 06	35 12
9	28	9	2565 73	1595 88	60 77
10	29	1	2400 30	1530 31	56 85
11	30	15	2349 34	1720 67	36 54

C Anthropometric measurements

1 Weight for age profile of the respondents

Use of weight for age in assessing the nutritional status of an individual gives the current status of the subject It gives a clear picture of the changes in nutritional supplies

Table 29 represents the weight for age profile of the respondents The observed average weight was compared with standards recommended by ICMR 1989 The average weight of 56 per cent of the respondents in the age group 20 24 years was 42 6 Kg, whereas 44 per cent respondents in the age group of 25 30 years were observed to have an average weight of 44 2 Kg

In both the age groups the weight for age was found to be signifinantly lower than standard weight recommended

Table 29

Weight for age profile of the respondents

Age (years)	Average Observed weight (Kg)	Number of samples	*Standard weight (Kg)	t value
20 24	42 6	56	50	2 67**
25 30	44 2	44	50	2 69**

* ICMR 1989 ** Significant at 1/ level

Following the Gomez classification, the respondents were grouped into three grades of malnutrition as shown in Table 30 (Fig 3) Sixty seven per cent were in the grade I and 27 per cent were in grade II malnutrition None of them belonged to grade III malnutrition Only six per cent were observed to be in the normal group

Fig 3
Classification of respondents based on grades of malnutrition

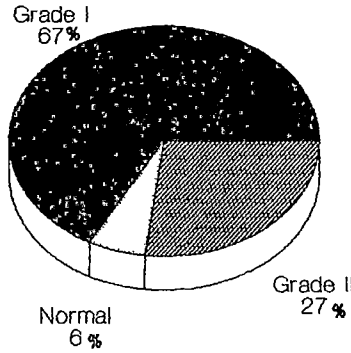


Table 30

Malnutrition of the respondents in terms of weight for age

Weight for age (%)	Malnutrition	Percentage
60%	Grade III	0
61-75%	Grade II	27
76 90%	Grade I	67
Above 90%	Normal	6
Total		100

2 Average height for age profile of the respondents

Unlike weight deficit, height deficit gives a picture of the past nutritional status It is a reflection of the non availability of nutrients to the body over a prolonged period of time

Table 31 reveals the average height for age profile of the respondents Fifty six per cent of the respondents in the age group of 20 - 24 years showed an average height of 153 8 cms, whereas the average height of the respondents in the age group of

25 - 30 years was 155 3 cms The average height of the respondents were significantly higher than the standard suggested by NNMB (1984)

Table 31

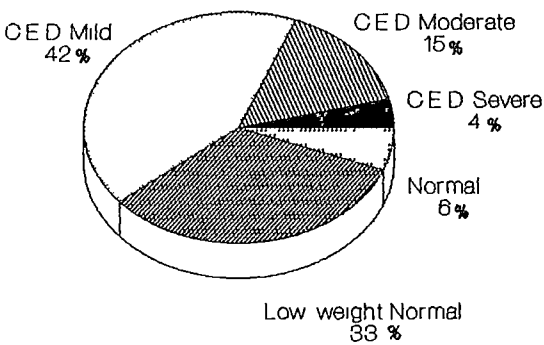
Height for age profile of the respondents

Age (years) (range)	Average observed heights(cm)	Number of samples	*Standard height (cm)	t-value
20 - 24	153 8	56	150 8	2 67**
25 - 30	155 3	44	150 8	2 70**

* NNMB - 1984 , ** Significant at 1/ level

The ratio between height and weight as reflected in Body Mass Index (BMI) was calculated and classified according to the severity of Chronic Energy Deficiency (CED) Table 32 (Fig 4) shows that 6 per cent were in the normal range of BMI Thirty three per cent of the respondents were having low weights, but considered in the normal group Forty two per cent of them

Fig 4
Body Mass Index Classification of the respondents



were in the mild chronic energy deficiency group (CED), whereas 15 per cent were in the moderate CED group and in 4 per cent respondents severe CED was observed

Table 32

Body Mass Index Classification of the respondents

* BMI Class	Percentage
16 0 (CED severe)	4
16-17 (CED Moderate)	15
17 1 18 5 (CED Mild)	42
18 6 20 (Low weight, Normal)	33
20 25 (Normal)	6
Total	100

* Nutrition News - 1991

3 Mid - Upper arm circumference of the respondents

The upper arm circumference taken between the acromion process and the elbow is an integrated measure for the skeletal, the muscular and the subcutaneous tissue components This measurement is closely, though not exactly, associated with changes in the subcutaneous tissues much because the tissue easily changes under varying circumferences

The arm circumferences of the respondents are shown in Table 33 In the present study, it may be observed that majority (62 per cent) of the respondents were having the measurement below 24 cms, while 28 per cent were in the range of 24 1 cms to 28 cms Only 10 per cent respondents were observed to have arm circumference above 28 cms

Table 33

Mid - upper arm circumference of the respondents

Arm Circumference range (cms)	Percentage
Below 24	62
24 1 28	28
Above 28	10
Total	100

4 Triceps skinfold thickness of the respondents (TST)

Skinfold measurements give an indication of how much energy reserves are available for the body These reserves are in the form of fat and are avilable mainly at the subcutaneous layers of the body The degree of outer fatness and the size of the muscle mass indirectly indicate protein and calorie reserves in the body (Frisancho and Garn, 1971)

The general trend, as observed in the present study (Table 34) indicated that triceps skinfold was far below the average standard TST, ranging from 7 0 to 10 5 mms in 59 per cent of the respondents and was 10 6 to 15 0 for 41 per cent of the respondents The average TST of the respondents were significantly lower than the standard suggested by Mayer and Seltzer (1965)

Table 34

Skinfold thickness of the respondents

Thickness (mm) (range)	Percentage	*Standard suggested skinfold thickness(mm)	Observed average skinfold thickness(mm)	t value
7 0 - 10 5	59	28 6	9 07	2 66**
10 6 15 0	41	28 6	12 22	2 70**

* (Mayer and Seltzer, 1965) ** Significant at 1/ level

D Clinical assessment

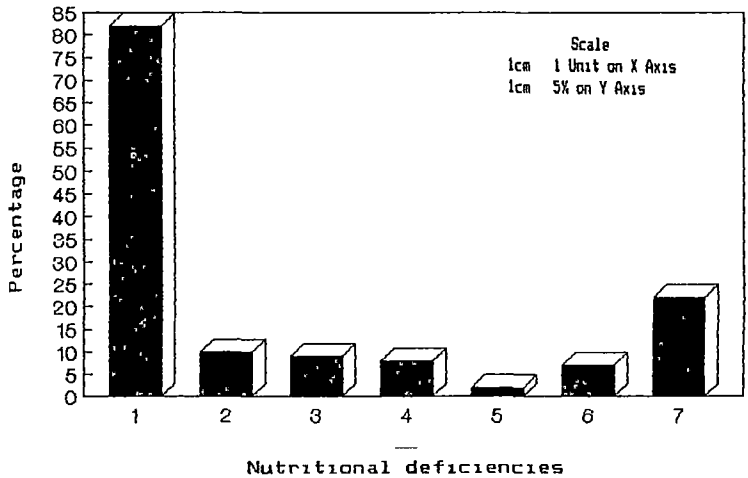
The clinical examination of the people forms an important practical method for the assessment of nutriture of a community (Gopaldas and Seshadri 1987)

Incidence of clinical signs and symptoms of the respondents are grouped under corresponding vitamins whose deficiency is the causative factor for prevalence and are presented in Table 35 (Fig 5)

Among the various clinical manifestations, 82 per cent of the respondents were found to be suffering from iron deficiency anaemia Ten per cent of them was observed, to have vitamin A deficiency,while 9 and 8 per cent respondents respectively suffered from vitamin B and vitamin C deficiency In 2 per cent respondents thyroid enlargement was present Angular stomatitis, pigmentation and cheilosis were the symptoms observed for B complex deficiencies in the respondents Spongy bleeding gums is a symptom of Vitamin C deficiency This deficiency was observed in 8 per cent respondents Non nutritional manifestations such as dental caries, was seen in 22 per cent respondents, besides mottled enamel in 7 per cent respondents

Fig 5

Incidence of Clinical symptoms among the respondents



Nutritional deficiencies

1	Iron	5	Iodine
2	Vitamin A	6	Fluorosis
3	Vitamin B	7	Dental caries
4	Vitamin C		

Table 35

Incidence of clinical symptoms among the respondents

Deficiencies/ Incidences	Symptoms	Percentage
Nutritional		
Iron	Anaemia	82
Vitamin A	Night blindness, Corneal Xerosis, Conjunctival Xerosis	10
Vitamin B	Pigmentation Angular Stomatitis, Cheilosis	9
Vitamin C	Gums Spongy bleeding	8
Iodine	Thyroid enlargement	2
Non-nutritional		
Fluorosis	Mottled enamel	7
Dental caries	Dental caries	22

1) Pulse rate of the respondents

The rate of pulse is noted to assess the proper cardiac function Anaemic subjects have to use higher heart rates for the same level of work compared to normal subjects and thus have a poor endurance capacity The physiological indicator of physical work capacity is the pulse rate (Table 36)

Table 36

Pulse rate of the respondents

Pulse rate (beats /minute)	Percentage
Below normal	23
Normal (72 beats/ minute)	35
Above normal	42
Total	100

2) Blood pressure of the respondents

The blood pressure or arterial pressure was also recorded to ascertain the proper cardiac function Abnormal blood pressure is found to affect the physical performance of people engaged in certain activities From the Table 37 it is revealed that 44 per cent respondents had normal blood pressure (120/80mm of Hg) and 50 per cent of them had high blood pressure, while 6 per cent respondents were having low blood pressure

Table 37

Blood pressure of the respondents

B P (mm of Hg)	Percentage
Below normal	6
Normal(120/80)	44
Above normal	50
Total	100

E Biochemical assessment

Biochemical methods involve estimating the level of nutrients in serum/blood, which yields data regarding the nutritional status of the individual with respect to the nutrients estimated In the present study the iron status of the respondents was estimated with regard to their iron intake using biochemical indicators like Haemoglobin, serum iron, Total Iron Binding Capacity (TIBC) and Packed Cell Volume (PCV), as depicted in Table 38

a) Haemoglobin levels

For estimating iron insufficiency measurement of haemoglobin is the most commonly employed biochemical indicator As it is evident from Table 38, only 18 per cent respondents were found to have normal levels of haemoglobin (12 gms/100 ml), two per cent of them had haemoglobin levels between 7 5 and 10 gms/100 ml blood, while 30 per cent had levels between 10 1 11 9 gms/100 ml

Detailed biochemical investigations like serum iron, total iron binding capacity and packed cell volume were carried out in venous blood, drawing 10 respondents and individual values are presented graphically (Figures 6, 7 and 8)

(b) Serum Iron

The direct measurement of iron in serum is extremely useful in detecting iron deficiency status The serum iron values obtained for 10 respondents ranged between 33 33 µg/dl to 109 39 µg/dl of which 40 per cent of them had the normal (acceptable) range of serum iron(i e 50 - 175 µg/dl) Deficiency of serum iron stores were observed in 60 per cent respondents as shown in Table 38

(c) Total Iron Binding Capacity (TIBC)

The Iron Binding Capacity estimate permits the distinction of nutritional deficiency from iron deficits due to infectious, inflammatory or neoplastic diseases As revealed from the Table 38 majority of them were having TIBC below the normal value (below 250 µg/dl)

(d) Packed Cell Volume (PCV)

Haematocrit / or PCV is the basic value revealing the degree of anaemia Table 38 had indicated that majority (90 per cent) of them had below 38 per cent of PCV which is below the normal range, while 10 per cent had normal range of 38 - 42 per cent

Fig 6

Serum iron content of the respondents

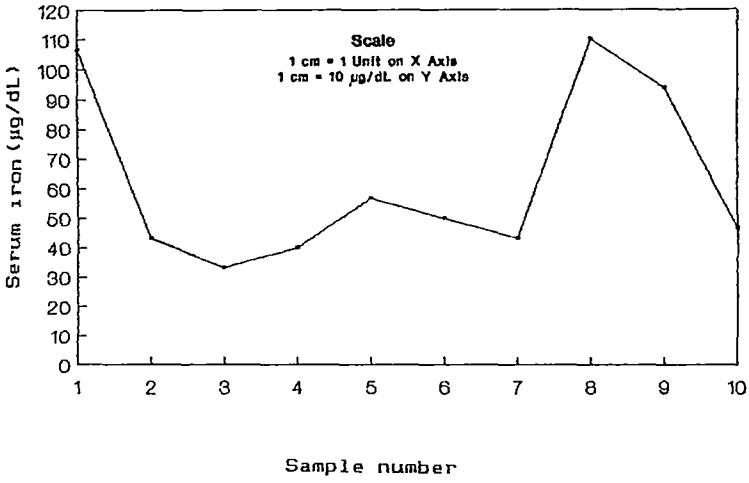
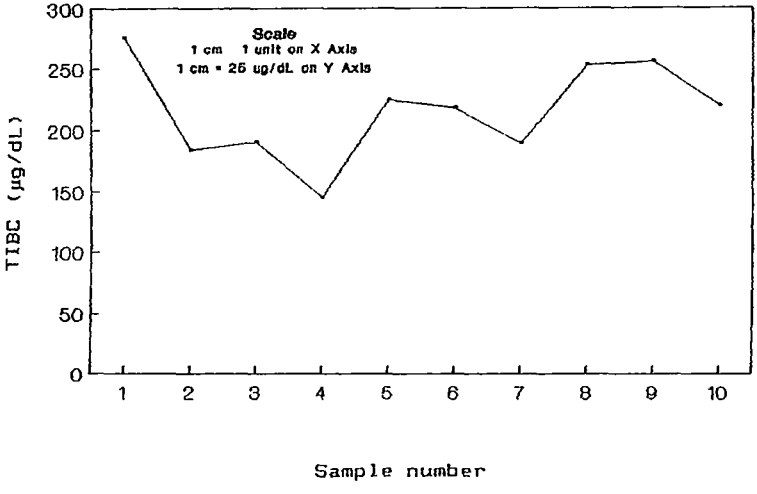


Fig 7

Total Iron Binding Capacity of the respondents



Distribution of the respondents according to the NSI are depicted in Table 39 The nutritional status index of the respondents ranged from 73 10 to 76 for 60 per cent , with an average of 74 39 Twenty five per cent respondents were having an average nutritional status index of 72 04 N S I computed was above 76 in 11 per cent respondents, while for 4 per cent respondents, it was below 70

Table 39

Nutritional Status Index of the respondents

Nutritional Status Index (Range)	Percentage	Average N S I
70 and below	4	69 63
70 1 - 73	25	72 04
73 1 - 76	60	74 39
Above 76	11	76 53
Total	100	

In the present study, work output of the respondents, in a way, is a reflection of their working efficiency The work output of the respondents per unit time was worked out and the average values are given in Table 40 Working efficiency of individual respondents are given in Appendix XIII

Fig 8

Packed Cell Volume of the respondents

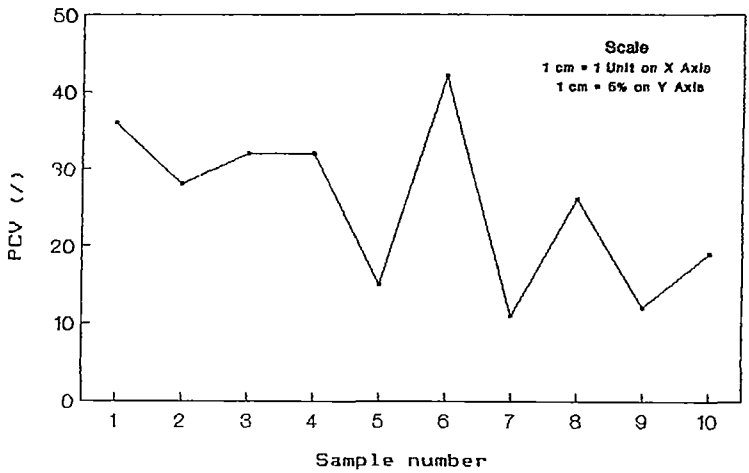


Table 38

Iron Status of the respondents

	Parameters	Ranges	Percentage
a	Haemoglobin (gms/100 ml)	7 5 11 9	82
		*12 and above	18
b	Serum Iron (µg/dl)	Below 50	60(6)
		*50 175	40(4)
c	Total Iron Binding Capacity (µg/dl)	Below 250	90(9)
		*250 - 350	10(1)
d	Packed Cell Volume (/)	Below 38	70(7)
		*38 42	30(3)

Figures in parenthesis indicates number
* Normal values

Nutritional Status Index and working efficiency of the respondents

Nutritional Status Index (NSI) of individual respondents was worked out and the values are given in Appendix XII

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Frequency distribution of respondents according to their working efficiency revealed that majority (61 per cent) of the respondents were found to have, an average working efficiency of 0 44, whereas 32 per cent of them had, average working efficiency of 0 62 Only 7 per cent respondents were having a working efficiency of 0 78

Table 40

Working efficiency of the respondents

Work output per unit time (Range)	Percentage	Average work output per unit time
0 30 - 0 5	61	0 44
0 51 0 7	32	0 62
0 71 - 0 9	7	0 78

The respondents were classified into two groups,based on the Nutritional Status Index those above the mean values and those below the mean values (73 79) Similarly respondents were classified based on their working efficiency The working efficiency of the respondents in relation to their Nutritional Status Index is depicted in Table 41

Table 41

Association between nutritional status and working efficiency

Working efficiency	Nutritional Status		Total
	Below average	Above average	
0 53 and below	27	33	60
Above 0 53	19	21	40
Total	46	54	100

Nutritional status index of the respondents was not related with their working efficiency as revealed by chi-square test of significance (χ^2 0 06)

Coefficient of correlation between independent variables on the working efficiency (dependant variable) of women engaged in stone breaking

The coefficient of correlation worked out between the 18 independent variables and working efficiency (dependant variable) of women labourers are given in Table 42

Of the socio economic variables monthly income (0 8457) of the respondents showed a significant positive

correlation with the working efficiency of the respondents, whereas age (0 0353) of the respondents showed a negative non significant correlation Experience in the job and working efficiency of the respondents showed positive correlation

Among the anthropometric measurements height (0 1130) and arm circumference of the respondents showed a positive but non significant correlation with the working efficiency However weight and Body Mass Index revealed a negative correlation with working efficiency

Major nutrients like energy intake (0 0363) showed a positive nonsignificant correlation and protein intake (-0 1124) showed a negative correlation with working efficiency of the respondents

Variables like pulse rate (0 0093), blood pressure (Diastolic) (0 0441), energy expenditure (0 0197) and clinical score (0 0274) showed a positive non significant correlation with working efficiency, whereas Blood pressure (Systolic) showed a negative correlation (0 0569)

Correlation worked out for Biochemical variables such as haemoglobin, Serum Iron, Total Iron Binding Capacity and packed cell volume indicated that, haemoglobin (-0 0807) showed a negative correlation and other variables viz Serum

Iron (0 2593) Total Iron Binding Capacity (TIBC) (0 4855) and Packed Cell Volume (PCV) (0 2859) showed a positive but non significant correlation with working efficiency

The variable, resting time in between the work of the respondents showed a positive significant correlation with working efficiency (0 3229)

Inter-relationship of different factors contributing to the working efficiency of stone breakers

The results of the analysis of inter relationship of the 18 different variables of the present study are presented in Table 42

An analysis of Table 42 revealed that the variable age of the respondents showed a positive significant correlation with experience (0 2006), height (0 4849), weight (0 3975), Arm circumference (0 4558) and energy expenditure (0 4295) of the respondents

The monthly income of the respondents indicated a positive significant correlation with resting hours (0 2415) between the works of the respondents and their working efficiency (0 8457)

A positive significant correlation was observed between resting hours between the work and height (0 2866), energy expenditure (0 2143) and working efficiency (0 3229)

The height of the respondents showed positive significant correlation with their weight (0 6133), arm circumference (0 2093) and energy expenditure (0 6232)

A significant positive correlation was found between weight of the respondents and BMI (0 7863), blood pressure (Systolic) (0 2207), energy expenditure (0 9573) and nutritional status (0 6206)

Body Mass Index showed a significant positive correlation with variables viz energy expenditure (0 7310) and nutritional status (0 6543) of the respondents

Haemoglobin showed a significant positive correlation with nutritional status (0 3393) of the respondents Pulse rate and blood pressure (Systolic) (0 2677) of the respondents showed a positive significant correlation

The blood pressure (Systolic) showed a positive significant correlation with B P (diastolic) (0 2750), clinical score (0 2339) and nutritional status (0 2562) of the respondents

A significant positive correlation was observed between nutritional status and energy expenditure (0 5865) and similarly with clinical score (0 7057) Energy intake and protein intake of the respondents showed a positive significant correlation (0 4334)

Inter-relationship of different factors contributing to the working efficiency of the stone breakers

X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14(+)	X15	X16	X17	X18
	* 0 2006	0 0962	** 0 0683	** 0 4849	0 3975	0 1111	** 0 9381	0 4558	-0 0233	0 0505	0 1805	** 0 4295	0 0353	0 0781	0 0700	0 0784	0 1719
		-0 0504	0 0800	0 1689	0 1606	0 0485	0 0418	-0 0655	00 0303	0 0328	-0 0257	0 1861	0 0438	-0 0092	-0 0827	0 2259	0 0356
			* 0 2415	0 1529	0 0204	-0 0748	0 0332	0 0849	0 0205	-0 0049	0 0130	0 0995	** 0 8457	0 0078	0 0644	0 0968	0 0282
				** 0 2866	0 1863	0 0336	0 1604	0 0329	0 0063	0 0754	0 0386	* 0 2143	** 0 3239	0 0021	0 0361	0 1480	0 0188
					** 0 6133	0 0049	-0 1439	* 0 2093	0 0553	0 1132	0 1032	** 0 6232	0 1130	0 0261	0 1496	0 150	0 1921
						** 0 7863	0 1673	0 1081	0 0173	* 0 2207	0 1373	** 0 9573	0 0536	0 0598	0 0315	-0 0411	** 0 6206
							0 0873	0 0227	0 0558	0 1636	0 0805	** 0 7310	0 1433	0 1121	0 0778	-0 0476	** 0 6543
								0 1382	0 0125	0 1094	0 0038	0 1672	0 0807	0 1498	0 0555	0 1587	** 0 3393
									0 0742	0 0292	0 1498	0 1849	0 1592	0 0710	0 0180	0 1061	0 1383
										** 0 2677	0 1370	0 0082	0 0093	0 0926	0 0024	0 1351	-0 0201
											** 0 2750	0 1957	0 0569	* 0 2339	0 1754	0 1891	** 0 2562
												0 1137	0 0441	0 1350	0 0781	0 0244	0 1601
													0 0197	0 0595	0 0264	0 0580	** 0 5864
														0 0274	0 0363	-0 1124	-0 0926
															0 0252	-0 0051	** 0 7057
																** 0 4334	0 0314
																	0 1206

Figure in paranthesis indicates dependent variable

X1 Age
X2 Experience
X3 Monthly Income
X4 Resting time
X5 Height
X6 Weight
X7 Body Mass Index
X8 Haemoglobin
X9 Arm Circumference
X10 Pulse Rate
X11 Blood Pressure (Sys)
X12 Blood Pressure (Dia)
X13 Energy Expenditure
X14 Working Efficiency
X15 Clinical Score
X16 Energy Intake
X17 Protein
X18 Nutritional Status Index

* Significant at 5% level

** Significant at 1% level

DISCUSSION

DISCUSSION

The present study was carried out to ascertain the various factors affecting working efficiency and the relationship of working efficiency with nutritional status of the women engaged in stone breaking

Socio Economic Patterns of the Families

According to Ramankutty (1990), better socio-economic status of women is reflected in better literacy, better work participation and greater independence within and outside the family On assessing the social back ground of the families, it was revealed that majority of the families were Hindus, predominated by under privileged community Sujatha (1990) also supports the same view Earlier, Padmanabhan (1981) also found the same, among the Agricultural labourers Nair (1988) has reported that majority of the landless women labourers belongs to scheduled castes/scheduled tribes Majority of the surveyed families were of nuclear type with approximately 50 per cent families having 5 to 10 members, the average family size

being 5 8, which clearly indicated that they have not adopted the small family norms Halim (1983) found that the average family size of women labourers in Bangladesh was 5 06 which was below the national average Fifty two per cent of the families had 5 7 members and 39 per cent had 1-4 members and the rest of the families had 8 10 members Gosh(1977) pointed out that family size had an important relation with nutrition of its members Devadas *et al* (1980) have reported that family size has an influence upon the development of children in all respects Thus in the present study, 50 per cent of the families were assumed to have a negative effect as far as family size is concerned

On assessing the number of adults and children in the families in relation to the family size, it was found that majority of the small sized families were having only 1-2 adult members, while the number of children in these cases ranged from 1 to 2 In majority of the big sized families, more than 3 adult members and lesser number of children were observed This clearly indicated that both in small sized and big sized families the number of adult population dominated the child population

Education is seen as a potential booster of the officially recorded female labour in developing countries

(Psacharopoulos, 1989) Educational qualifications of the families indicated that majority of the members like parents and respondents had obtained at least primary level education, but when compared to parents, respondents were found to be more educated, some of them having reached upto high school levels This observation is unlike those reported by Dighe (1991), who found that educational status of a vast majority of Indian Women is abysmally low, as they are required to work at a very early age and thus not likely to enter school and more likely to drop out because of all the socio-economic pressures Kalsi (1991) also observed that in industrialising Asian region, schools literally drive children away from education and with the limited future left, the parents mostly under compulsion of circumstances, send children to work In the present study it is thus clear that the employed respondents were in a better position than that of parents with regard to their educational attainments

Regarding the employment status of the respondents parents, it was observed that majority of the respondents fathers were unemployed when compared to mothers Mankekar (1980) has reported that the women account for 40 per cent of total unemployment Kumar (1978) viewed that higher income from maternal employment is likely

to alleviate economic distress and to improve nutritional status of children Out of the majority of employed mothers, many are stone breakers With regard to the employment status of the respondents, all of them were engaged solely in stone breaking According to 1981 census 89 5 per cent of the total family work force operates within the unorganised sector, mainly as self employed wage earners or engaged in stone quarries as casual labourers Nair (1990) has reported that women in unorganised sector suffer from fewer and poorer opportunities to work, face greater impact of employment, unemployment and casual nature of work

Economic status of the families indicated that majority of them were in the monthly income range of Rs 500/- to Rs 1000/- The per capita income ranged from Rs 100/- to Rs 200/ in 45 per cent of the families Sreenath *et al* (1978) indicated that the per capita income decreased with an increase in family size According to National sample survey, (1987 88) in rural India, about 50 per cent of the rural population spend less than Rs 140/- month per person Bhatt (1985) found that average contribution of a single female worker in a family works out to Rs 3,130/- per annum

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Among the families surveyed, the major source of income, for 46 per cent families was found to be stone breaking, contributing 26 50 per cent to family income Sujatha (1990) also reported that for majority of the women employed in unorganised sector, the major source of the family income was from stone breaking Other occupations of the families surveyed such as casual labour/coir making contributed 26-75 per cent of the income for 68 per cent families The contribution from agriculture was negligible for majority of the families

The physical amenities available for the families with respect to monthly income indicated that almost all the families possessed a house of their own, and majority enjoyed the public tap water facilities Irrespective of the monthly income category, other facilities like drainage, lavatory and electricity were available only for a few families George (1987) reported that the lack of physical facilities such as water, latrine, drainage etc resulted in poor environment and personal hygiene in people of coastal areas of Thiruvananthapuram district

An analysis of the respondents exposure to mass media, indicated that only a few respondents were having high exposure to mass media, whereas majority of them were found to be in the low to medium exposure group

The monthly expenditure pattern of the families revealed that, in most of the families the major expenditure was for food Similar result was seen in the study conducted by Kaur and Mann (1988) among low socio-economic group families in Punjab Quiogue (1970) found that lower the income, the higher was the percentage of income spent on food Wong *et al* (1985) also found a direct relation between the amount of family income and expenditure on food Sreenath *et al* (1975) also reported similarly Next to food, the expenditure incurred was for health In any families with woman as earning member, she spends a part of her earnings towards health care of the children (Vijayalekshmi 1987) For the other items like clothing, education, cosmetics, transportation etc majority of the families spend only a low percentage of their income (5/) Sreenath *et al* (1978) indicated that money spent on clothing and education were reduced when the per capita income decreased For majority of the families expenses on recreation, luxury items personal expenses and rent were negligible Sidhu (1986) observed that in rural areas families with employed wives spent more on ceremonies, indicating a high degree of association between expenditure and employment position of wives

Saving trend was not present among the surveyed respondents and many of them were found to have debts The expenditure pattern of the families thus gives the inference that the money they get is mainly used for meeting their food expenditure, neglecting all the other basic needs

Food consumption pattern of the families

Dietary habits of the families indicated that all of them were habitual non vegetarians

Expenditure pattern of the families on various food stuffs revealed that the major expenditure incurred by the families was for cereals, mainly rice Kaur and Mann (1988) reported that in low socio economic groups the major expenditure was for cereals The families spent about 25-50 per cent of their income for purchasing cereals Next to cereals fish was found to be item on which expenditure is incurred by majority of families-the percentage being 11-20 Expenditure on food items viz , roots and tubers, fruits, and sugar and jaggery was only upto 5 per centformore than 50 per cent of the families This observation is unlike those reported earlier by Sujatha (1990) who reported that the expenditure on food items like rice, fish and tapioca were higher than other food items among the women workers in unorganised sector Another notable feature with

regard to the expenditure pattern was that the families do not spend any money for purchasing green leafy vegetables, egg, meat and bakery items Mathew (1989) reported that leafy vegetables and fruits were not included in the diets of female industrial workers According to Srinivasan *et al* (1991) poor intake of foods and most of the nutritional problems of the rural households are traced to their low purchasing power vis-a-vis high and rising prices of essential commodities

On analysing the frequency of various food items by the respondents, it was obvious that cereals was the main item included daily in their diets, along with condiments and spices This observation is in tune with the result reported by Varghese (1989) Next to cereals fish and milk and vegetables were the items frequently included in respondents diet Milk is used by respondents only added to coffee and tea Consumption of pulses, green leafy vegetables and fruits were occasional in majority of the families Roots and tubers especially tapioca was consumed by some of the respondents, once in a week This observation is unlike those reported by Sujatha (1990), who observed that majority of the women working in unorganised sector were in the habit of consuming tapioca daily Flesh foods like meat and egg and bakery items were rarely used by majority of the respondents

Frequency of use of food stuffs among the respondents also indicated that cereals, vegetables, milk, fish, fats and oils, sugar and jaggery and spices were the most frequently used food items, whereas roots and tubers was used only in medium frequency Pulses, green leafy vegetables, fruits, meat, egg, and bakery items were the food items used in low frequency by the respondents Kaur and Mann (1988) observed that the consumption of green leafy vegetables meat and egg was negligible in low socio-economic groups From these observations it is clear, that cereals and fish were the items mainly used in the dietaries of the respondents, whereas expensive food items viz , fruits, flesh food, pulses, vegetables and bakery items were the least included items in their dietaries Lina and Reddy (1984) reported that a typical Kerala dietary pattern, would be based on rice, fish, tapioca and coconut

Meal frequencies of the respondents revealed that majority followed three meal-a-day pattern This is in contrast with the observation of Mathew (1989) who reported that two meal-a-day was followed by the industrial workers Swaminathan (1986) has revealed that increasing the frequency of meals in terms of size and number influences the work performance of individuals engaged in heavy activities

Personal characteristics and work pattern of the respondents

On assessing the personal details of the respondents it was found that all the respondents were in the age group of 20-30 years Mathew (1989) found that majority of the female industrial workers engaged in brick kiln work, belonged to the age group of 20 40 years Regarding the respondents experience in the present job, most of them were found to have an experience of above 4 years Experience of less than 2 years was observed only in a few respondents Padmanabhan (1981), in his study, observed that majority of the efficient men labourers engaged in farming work had an experience ranging from 10 30 years

Economic disability was found to be the main reason for the selection of this occupation by all the respondents Dighe (1991) reported that due to the conditions of poverty, the rural women, besides their daily struggle for basic necessities and the household chores were forced to go for outside work More than two members were found to be engaged in stone breaking in 47 per cent of the families surveyed Average income earned by 48 per cent of the respondents per month through stone breaking, was between Rs 301/ to Rs 400/ , while 38 per cent earned Rs 201/- to Rs 300/- per month The money thus earned by

most of them was not sufficient to meet their family requirements as viewed by them

Majority of the respondents were found to be dissatisfied with work mainly due to the health hazard and partly due to the meagre wages and heavy work load Mukhopadhyaya (1987) revealed that among working women in India, the occupational hazards relating to monotonous working conditions in unsanitary environments in occupations such as coir making, stone breaking, handloom industries affect the health of women workers Supekar *et al* (1990) have pointed out that rural and tribal women take up works outside home, regardless of the physical stress and strain involved in it

For majority of the women the work site was easily accessible (ie , within half a kilometer) and they reached their work spot by walking

With regard to the working schedule of the respondents, it was noted that majority of them worked above 7 hours per day The percentage of respondents who worked below 6 hours and above 9 hours was found to be negligible Nair (1990) has reported that women work for longer hours and contribute substantially to the family income

Majority of the respondents in the present study were found to engage in work for almost all the days in a week Earlier, Batliwala (1989) has reported that majority of the workers work six days in a week

Wages were paid to the respondents on the basis of their work output, and in the study quantity of stone broken by majority of them was found to be more than 3 baskets per day Chitnis (1983) has reported that work output of women is lower than that of men at the same task and consequently the women are paid less All the respondents surveyed were found to take assistance in their job for breaking larger stones, loading and unloading etc and they were hardly absent in their work

On enquiring about the resting pattern of the respondents in between the work, it was evident that most of them were found to take only half an hour rest According to Chakraborthy (1985) rural women in the developing countries invariably work hard with little time for leisure and rest

Many of the respondents surveyed, were not in the habit of eating any food items in between the work Some of the respondents who consume food in between work hours, took Kanji brought from their home or purchased from the nearby

shops Majority of respondents were found to have lunch in their homes Spurr *et al* (1977) revealed that the rate of production after the meal was higher than that before the meal

Regarding the difficulties confronted by the respondents, it was revealed that, at times, they face scarcity of stones Only a few of them were getting loans for the purchase of stones Majority of them complained about the health hazards, meagre wages and risk factors owing to this work Sundhari (1990) reported that the position of Indian Women is characterised by increasing concentration of the work force in the unorganised sector, with no job security, arduous working conditions and low wages Mukherjee (1992) also reported that employment in informal sector is strenuous, it also provides low returns

Impact of stone breaking on the health of the respondents indicated that, almost all of them were having one or other sorts of health problems viz , anaemia, headache, chest pain, fever etc According to Eng (1983) women tend to have more ailments such as varicose veins, backaches, back injuries, compared to men, since their work around the house, as well as in the work spot, involves a lot of bending, lifting and standing Anaemia, gastro-intestinal ailments, respiratory diseases, malnutrition,

T B parasitic infestation and malaria are reported to be common nutritional and health disorders prevalent among women in our country (Kishwar 1988) It was notable that not even a single person has escaped from getting cuts and wounds while performing her job

Majority of the respondents were found to have negative attitude towards this occupation Fleishman (1965) has reported that job satisfaction is positively related to work performance Verma *et al* (1988) opined that job satisfaction is important for one s psychological well being and high productivity

In addition to stone breaking, majority of the surveyed respondents were found to attend to the house hold works According to Bagchi(1985) in addition to work load at home, employed women undertake an extremely strenuous load of work Khan (1987) viewed that working women are doubly burdened with paid as well as domestic work and their working hours are longer causing extra metabolic strain Pandey *et al* (1988) reported that rural women were observed to work from 9-14 hours per day including the domestic chores Similar findings was observed in the present study also

Assessment of nutritional status of the respondents

The actual food intake of the respondents revealed that roots and tubers and fish, met above the RDA suggested by ICMR (1989) All the other food group met only below the RDA suggested According to Sreenivasan (1991), the consumption levels of cereals, vegetables, pulses, milk and milk products and oils were very low among occupational groups viz , agricultural labourers, artisans etc The food group which was found to meet nearly the suggested RDA was cereals The food group which met the RDA least, was green leafy vegetables followed by milk, other vegetables and fruits Gupta *et al* (1988) reported that compared to RDA, the diets of working women were largely unbalanced and lacked in leafy vegetables and protective foods like egg and meat

Among the various nutrients, protein, calcium, thiamine and niacin were found to meet the RDA almost adequately among the respondents surveyed However the nutrients such as energy foods and Iron met the RDA only around 60 per cent, the deficiency in both of which is assumed to affect the work performance of the respondents Khan and Patel (1989) reported that calorie intake of the subjects did not meet the RDA Gupta *et al* (1988) revealed that compared to RDA the deficit in energy intake of manual

workers could be related to their low body weight In contrast to the former studies, Prahlad and Sastry (1986) have reported that house holds from lowest income group showed relatively greater gains in average intake of calories than those from higher income groups Agarwal (1991) pointed out that inadequate supply of nutrients like iron, folic acid and Vitamin B_{12}, causes nutritional anaemia characterised by reduced haemoglobin concentration The requirement of the vitamin A was found to be one among the least met nutrients among the respondents, which reflected in the low consumption of green leafy vegetables Bhat and Dahiya (1985) have indicated that majority of the Indian home diets are deficient in Vitamin A Mathew (1989) also pointed out that vitamin A was far below RDA in those subjected to his studies

According to Nair and Poehlman (1991) energy balance is determined by energy intake and energy expenditure Durnin (1990) stated that satisfactory energy balance is not attainable, if the energy intake is low Satyanarayana (1991) has reported that work like stone breaking costs 7 K cals of energy per minute The energy balance of the respondents surveyed showed that all of them had a negative trend, the deficit ranging from 29-60 percent Devadas *et al* (1975) also have reported that manual women workers engaged in construction works showed a negative energy balance

Anthropometric measurements taken for assessing the nutritional status of the respondents revealed that the average weight for age of the respondents was 43 4 Kg, which was significantly lower than the standard suggested by ICMR (1989) According to the report of NNMB (1984) the overall average weights of adult women from middle income group, industrial labour and slum dwellers aged 20-40 years is 45 2 Kg Satyanarayana (1989) opined that the relative work capacity viz , work capacity/Kg, lean body weight (Kg) and body weight Kg are under the influence of local factors Classification by Gomez *et al* (1956) pertaining to the degree of malnutrition indicated that grade I malnutrition was prevalent among majority of the respondents

Spurr *et al* (1977) have reported that weight or lean body weight could account for more than 50 per cent of the variation in work out put, whereas height could account only for 19 per cent variation

The average height of the respondents was observed to be 154 6 cms, which was above the average height (150 8 cms) of adult women aged 20-40 years reported by NNMB (1984)

Classification of Body Mass Index (BMI) revealed that 39 per cent of the respondents belonged to the normal

group, whereas majority suffered from mild-moderate forms of energy deficiency According to Satyanarayana (1989) extremes of BMI (for undernourished and obese) are associated with low productivity in both men and women in industrial workers

The skinfold thickness of majority of the respondents ranged between 7 6 - 10 5 mms From a study conducted by Flores *et al* (1984) among Agricultural labourers it was observed that, their work capacities was significantly affected by fat free mass Majority of the respondents were found to have arm circumferences below the normal values suggested Chesher (1979) found a positive relationship between work output and arm circumference among Kenyan road workers Hence it is assumed that in the present study, the work capacities of the respondents will be affected negatively

The results of the clinical examination of the respondents showed the occurrence of anaemia among most of them This finding is in accordance with the study of Mathew (1989) who had reported that female industrial labourers suffered from mild or moderate forms of anaemia The results of a survey conducted in Hyderabad by Balakrishnan(1990) also indicated that majority of adult women are anaemic Corneal Xerosis, Cheilosis and spongy

bleeding gums were the other clinical manifestations noted in the respondents under study NNMB/ICMR (1988) studies suggested that significant vitamin A deficiency is almost universal in terms of geography According to Johnson *et al* (1942) , men doing hard physical work and consuming B complex deficient diets, exhibited various symptoms of the same and their work performances deteriorated within a week Non nutritional manifestations such as flourosis and dental caries were present in a few of the respondents surveyed The incidence of dental caries was reported to be high in Kerala (NNMB, 1984) Jelliffee (1966) viewed that refined carbohydrate foods or use of sugars are associated with increased tendencies towards dental caries, which reflected in the present study also,as the respondents were used to consume mostly refined carbohydrate foods

An analysis of the cardiac function of the respondents with respect to pulse rate and blood pressure, in the present study, revealed that, 42 percent was having higher pulse rate which is an indication of anaemia among the respondents Devadas (1988) reported that the mean pulse rate of the anaemics would be 75-94 beats/minute According to Satyanarayana (1991), higher heart rate and higher metabolic stress at a given work level are signs of inferior physical fitness Earlier, in 1979 he also reported that

undernourished subjects had significantly higher heart rates for a given work load Seshadri (1988) observed that the post exercise pulse rate was significantly higher in anaemic boys Shaver (1982) has stated that the type of exercise definitely influences the increase in heart rate

The blood pressure profile of the respondents was also observed, which indicated a rise in B P level above the normal Devadas (1988) also reported that mean blood pressure for the anaemic subjects increased dramatically from 117/78 to 140/86 after an activity Shaver (1982) indicated that, the average B P tends to be lower in underdeveloped countries than in western societies He also reported that, when one works dynamically with small muscles such as with arms instead of legs in work above the waist, a greater than normal increase in B P is generally observed

Biochemical investigations carried out for assessing the iron status of the respondents indicated that, the haemoglobin levels was below normal in the case of majority of the respondents Sujatha (1990) in her study also reported the same view Rammohan and Devaki (1988) observed that, the average haemoglobin levels of women suffering from mild to moderate iron deficiency was 8-10 gm/dl Seshadri (1988) found that elevation of haemoglobin

by iron treatment resulted in an increase in work capacity among anaemics Iron status as reflected in serum iron levels indicated, a deficiency of iron stores in majority of the respondents Bothwell *et al* (1979) revealed that serum iron of < 40 µg/dl is considered diagnostic of iron deficiency uncomplicated by infection or other disorders which affect iron metabolism They also reported that serum iron show a consistent and progressive fall when negative iron balance occurs Ohira *et al* (1981) viewed that subjects with low serum iron were shown to exercise for a shorter length of time on a treadmill when compared to those who had higher serum iron levels According to Raman (1989), the iron nutritional status as judged, by serum iron and incidence of anaemia were higher in rural girls Bothwell (1979) reported that, exhaustion of body iron reserves is associated with decrease in stainable iron in the bone marrow, fall in serum ferritin to levels below normal and increase in iron absorption and iron binding capacity The increase in the Total Iron Binding Capacity (TIBC) in general, occurs before a fall in serum iron and therefore its increase suggests depletion of iron stores (Bothwell, 1979) In the present study TIBC levels was found to be below normal in majority of the respondents which reflects that serum iron levels were not too low The volume of packed cells (PCV) in 100 ml blood was also found to deviate from the values, in most of the cases

WHO criteria for the diagnosis of iron status revealed that in adult females, the serum iron, TIBC and haematocrit / were interpreted to be deficient, if the levels were below 40, below 15 and below 31 respectively (Gopaldas and Seshadri,1987) Thus on analysing the iron status of the respondents, it can be concluded that depleted iron stores of the respondents has got some implications on their working efficiency

According to Swaminathan (1986) nutritional status of an individual is the health status of the individual as influenced by the intake of essential nutrients The average Nutritional Status Index developed for the respondents indicated that, for majority of the respondents, the N S I was 74 39 The average working efficiency for majority of the respondents was 0 44 In the present study,working efficiency of the respondents was not in association with the Nutritional Status Index(NSI) developed,indicating that their working efficiency was in no way influenced by their NSI as revealed by the chi-square test of significance Similarly when working efficiency was independently correlated with different factors such as socio economic, anthropometric, clinical and biochemical parameters, it was found that only monthly income of the respondents and the resting hours in between the work showed

a significant correlation with their working efficiency On the other hand out of the different factors exhibiting inter relationship, nutritional status Index was found to be significantly associated with body weight, Body Mass Index, haemoglobin, clinical score, energy expenditure and intake of calories and protein

SUMMARY

SUMMARY

The present study entitled **Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status** was conducted among 100 women in the age group of 20 30 years, residing in Vizhinjam panchayat of Thiruvananthapuram District

The study carried out threw light, upon the socio economic and food consumption pattern of the families, personal characteristics and work pattern, energy balance and nutritional status of the respondents

Information regarding socio economic background of the families indicated that majority of them were Hindus and predominantly belonged to underprivileged communities Majority of the families surveyed were of nuclear type, with approximately 50 per cent families having 5 10 members In majority of the families both big sized and small sized, the number of adults were exceeding the number of children Regarding the educational attainments, the respondents were in a better position than that of their parents When

compared to respondents mothers majority of their fathers were employed Majority of the families were having a total monthly income of above Rs 500/ mainly from stone breaking and the per capita income of the family ranging between Rs 100/- to Rs 200/- for nearly 50 per cent of the families The physical amenities, like drainage, lavatory and electricity facilities were available only for negligible number of families Most of the respondents were having low exposure to mass media The major expenditure of the families was for food, followed by health

All the families surveyed were habitual non-vegetarians The expenditure pattern on food revealed that the major expenditure incurred by the families was for cereals succeeded by the expenditure on fish Cereals, vegetables, milk, fish, fats and oils, sugar and jaggery and spices and condiments were the most frequently used food items, whereas pulses, green leafy vegetables, fruits, flesh foods and bakery items were the less frequently used food items of the respondents Three meal a-day pattern was followed by majority of the families

On evaluating the personal characteristics and working pattern of the respondents, it was noted that most of them had an experience above 4 years In a family more than two members were found to be engaged in stone breaking

The average income earned by majority of the respondents was between Rs 300/- to Rs 400/ The respondents worked above 7 hours per day for almost all the days in a week, the quantity of stone broken by majority being more than 3 baskets per day Most of the respondents took only half an hour rest in between the work Many of the respondents surveyed, were not in the habit of eating any food items in between the work Health hazards, meagre wages and risk factors, owing to this work were the difficulties confronted by the respondents In addition to the work load outside the home, majority of them had to attend to the household works and above all the attitude towards their occupation, made their work more strenuous

All the respondents surveyed were having a negative energy balance, the energy expenditure being higher than their intake

Actual food intake of the respondents revealed that, the average intake of foodstuffs like roots and tubers and fish met above the recommended dietary allowances, whereas intake of green leafy vegetables met the RDA least Regarding their nutrient intake, except protein, calcium, thiamin and niacin which met the RDA almost adequately, all the other nutrients were found to be inadequate when compared with Recommended Dietary Allowance (RDA)

The anthropometric assessment indicated that, weight for age of the respondents were significantly below the ICMR and NNMB standards, whereas height for age met significantly above the standards The triceps skinfold thickness ranged from 7 6-10 5 mms in majority of the respondents and their arm circumferences fell significantly below the standard Clinical examination of the respondents showed the occurrence of anaemia among most of them Analysis of the cardiac function of the respondents with respect to pulse rate and blood pressure revealed that majority of them had high pulse rate and blood pressure, indicating signs of inferior physical fitness Biochemical investigations carried out to assess the iron status of the respondents, showed that majority of the respondents were having a negative iron balance

In the present study, working efficiency of the respondents was not associated with the Nutritional Status Index (NSI) developed, indicating that their working efficiency was in no way influenced by their NSI, as revealed by the chi-square test of significance When working efficiency was independently correlated with different factors affecting the working efficiency of the respondents, it was found that only monthly income and the resting hours in between their work were having a significant correlation with working efficiency

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APPENDICES

APPENDIX I

KERALA AGRICULTURAL UNIVERSITY

Department of Home Science, Vellayani

Name of the investigator Kumari JYOTHI AUGUSTINE

Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status

Schedule to elicit the socio-economic background of the families.

1 Name of the respondent

2 Full address

3 Religion

4 Caste

5 Type of family

6 Family size

7 Number of adults in the family

8 Number of children in the family

9 Educational status of father

14 Employment status of mother

15 Income from stone breaking per month

16 Income from other occupations per month

17 Income from Agriculture or land

18 Per capita income of the family

19 Total family income per month

Physical amenities available for the family

20 Ownership of a house

21 Source of drinking water

22 Drainage facilities

23 Lavatory facilities

24 Electricity facilities

Exposure to mass media of the respondent

25 Reading newspaper

26 Reading weeklies / magazines

27 Viewing T V

28 Listening radio

29 Monthly expenditure pattern for

1 Food

2 Clothing

3 Rent

4 Transport

5 Education

6 •Health

7 Savings

8 Recreation

9 Personal expenses

10 Cosmetics

11 Ornaments

12 Debts

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY

Department of Home Science, Vellayani.

Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status

Schedule to assess the food consumption pattern of the families

1 Eating habit of the family

2 Eating habit of the respondent

Food expenditure pattern of the family in percentage of total monthly income.

3 Cereals

4 Pulses

5 Vegetables

6 Green leafy vegetables

7 Roots and tubers

8 Fruits

9 Egg

10 Meat

11 Fish

12 Fats and oils

13 Sugar and jaggery

14 Spices and condiments

15 Bakery items

Frequency of using different food stuffs

16 Cereals

17 Pulses

18 Vegetables

19 Green leafy vegetables

20 Roots and tubers

21 Fruits

22 Milk

23 Fish

24 Meat

25 Egg

26 Fats and oils

27 Sugar and jaggery

28 Bakery items

29 Spices

30 Types of food articles produced at home

31 Meal frequency followed by the respondent

APPENDIX III

KERALA AGRICULTURAL UNIVERSITY

Department of Home Science, Vellayani

Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status

Schedule to collect the personal characteristics and work patterns of the respondent.

1 Age

2 Experience in stone breaking

3 Reason for selecting this job

4 Number of members engaged in stone breaking

5 Income earned from this job / month

6 Utilization of money getting from the job

7 Whether the income from the job is sufficient or not for meeting the family requirements

8 Job satisfaction of the respondent

9 Distance to the work site from home

10 Means of reaching the work site

11 Starting time of work

12 Ending time of work

13 Average working time per day

14 Days spent in stone breaking per week

15 Basis on which the wages are paid

16 Quantity of stone broken by the respondent per day

17 Resting pattern of the respondent during work

18 Eating habit in between the work

19 Foodstuffs eaten in between the work

20 Source of food eaten in between the work

21 Types of assistance sought by the respondent during work

22 Source of getting assistance during work

23 Item of work during stone breaking

24 Occasions during which the respondent does not engage in work

25 Difficulties faced by the respondents in the job

26 Health problems due to work

27 Types of illnessess the respondent had

28 General opinion about this work

29 Works undertaken additional to stone breaking

30 Time spent for works other than stone breaking

APPENDIX IV

Individual dietary survey - 24 hour recall method

SL No

Name of the respondent

Age

a Foods taken from home

Types of food preparation	Raw quantity of each ingredient (gm)	Total cooked amount (gm)	Individual Intake (cooked volume) (gm)
1			
2			
3			
4			
5			

b Food taken from outside

Types of food preparation	Raw quantity of each ingredient (gm)	Total cooked amount (gm)	Individual Intake (cooked volume) (gm)
1			
2			
3			
4			
5			

APPENDIX V

Prediction equation for determining the energy expenditure pattern of the respondent

Energy expenditure	Basal Metabolic Rate (BMR) factor X BMR
BMR factor recommended by ICMR for adult women engaged in heavy activity	2 5
BMR suggested by ICMR expert group for Indian adult female	14 X Body Weight (kg) + 471

APPENDIX VI

KERALA AGRICULTURAL UNIVERSITY

Department of Home Science

Nutritional Assessment Schedule

National Institute of Nutrition

Serial No

Name of the respondent

Age

Anthropometry

1 Weight 2 Height 3 Triceps skinfold thickness

4 Mid-upper arm circumference

Clinical Examination

1	Parotid enlargement	18	Pigmentation of Knuckles/ fingers/toes
2	Oedema	19	Phrynoderma
3	Emaciation	20	Koilonychia
4	Marasmus	21	Gums-spongy, bleeding
5	Conjunctival xerosis	22	Knock-knees or bow legs

6 Bitot s spots

7 Corneal xerosis/ Keratomalacia

8 Night Blindness

9 Photophobia

10 Anaemia

11 Naso labial dyssebacea

12 Angular stomatitis

13 Cheilosis

14 Tongue-Red and raw

15 Atrophic lingual papillae

16 Pellagra

17 Craz pavement dermatosis

23 Frontal and parietal bossing

24 Teeth caries

25 Mottled enamel

26 Enlargement of spleen

27 Enlargement of liver

Soft

Firm

Hard

28 Thyroid enlargement

Cardiac function

1 Pulse rate 2 Blood pressure

APPENDIX VII

Measurement of blood pressure

The blood pressure can be measured accurately using a sphygmomanometer The patient should be sitting or lying at ease while measuring The manometer is placed so as to be at the same level as the observers eye All the clothing should be removed from the arm The cuff should be applied closely to the upper arm, with the lower border not less than 2 5 cm from the cubital fossa

The radial pulse is palpated while the cuff is inflated to a pressure of 30 mm Hg above the level at which radial pulsation can no longer be felt The stethoscope is then placed lightly over the brachial artery The pressure in the cuff is lowered, 5 mmHg at a time, until the first sounds are heard This is the systolic pressure Continue to lower the pressure in the cuff until the sounds suddenly become faint This is the diastolic pressure Continue to

reduce the pressure and between 1 and 10 mm Hg lower the sounds disappear completely Thus the sounds may first appear when mercury falls to 210 (systolic pressure), disappear from 180 to 160 (silent gap) reappear and finally disappear at 120 (diastolic pressure)

APPENDIX VIII

Estimation of Haemoglobin (Cyanmethaemoglobin method)

Principle

Haemoglobin is converted into cyanmethaemoglobin by the addition of KCN and ferricyanide The colour of cyanmethaemoglobin is read in a photoelectric colorimeter at 540 nm against a standard solution Since cyanide has the maximum affinity for haemoglobin, this method estimates the total haemoglobin

Reagent

Drabkin s solution Dissolve 0 05 g of KCN, 0 02g of potassium ferricyanide and 1 00g of sodium bicarbonate in 1 litre of distilled water

Procedure

20µl of blood is transferred with the help of a haemoglobin pipette and delivered on to a whatman No 1 filter paper disc The filter paper is air dried, labelled and can be stored upto one week The portion of filter

paper containing the blood is cut and dipped in 5ml of Drabkin s solution taken in a test tube Wait for 30 minutes and mix the contents in the tubes, take the readings in a photoelectric colorimeter The reagent blank (Drabkin s diluent) is adjusted to zero

Construction of standard curve

If the blood drawn from the subject contains haemoglobin 15g/dl after estimation then prepare three reference standards as follows

1 Reference standard A

4 ml of blood in 1000ml Drabkin s reagent contains haemoglobin 15 g/dl

2 Reference standard B

300 ml of reference standard A + 200 ml Drabkin s reagent contains haemoglobin concentration of 10g/dl

3 Reference standard C

200 ml reference standard A and 300 ml Drabkin s reagent contains a haemoglobin concentration of 7 5 g/dl

Thus we have three reference standards at three levels of haemoglobin concentration use 5 ml from each standard whenever haemoglobin estimations are done

APPENDIX - IX

Estimation of Serum Iron (Wong s method)

Principle

Iron is determined colorimeterically making use of the fact that ferric iron gives a blood red colour with pottassium thiocyanate

Reagents

1 30/ H_2SO_4

2 7/ potassium persulphate solution 7g potassium persulphate is dissolved in glass distilled water and this solution is made upto 100 ml

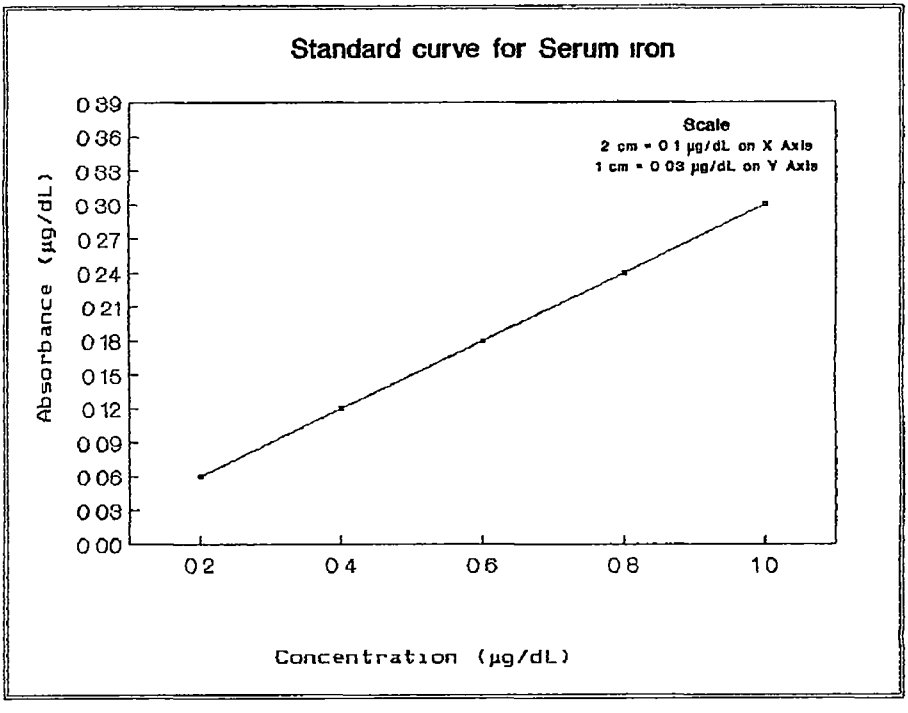
3 40/ potassium thiocyanate solution 40g KCNS is dissolved in 90 ml glass distilled water, 4 ml acetone added and volume made upto 100 ml

4 Standard iron solution 702 2 mg ferrous ammonium sulphate is dissolved in 100 ml glass distilled water and after addition of 5ml of 1 1 Hcl, the solution is made upto 1 litre and mixed thoroughly (0 1mg Fe/ml) The standard solution is prepared fresh once in 6 months

Working standard solution (10µg Fe/ml) is prepared by diluting the above solution 10 fold

Procedure

Two ml of conc H_2SO_4 is taken in a 50ml volumetric flask Add exactly 0 5 ml of well mixed blood, mix and to this add 2ml of potassium persulphate, agitate the flask, cool and dilute with about 25ml distilled water Then 2ml of sodium tungstate is added and the volume made upto the mark Filter using Whatman No 42 filter paper Transfer 15 ml of the filterate to a fresh tube, add 1 ml of potassium persulphate and 4 ml of potassium thiocyanate Mix and read the colour at 540 nm in a colorimeter A standard (10-100µg) is run similarly and a standard graph is prepared


Standard curve for Serum iron
Scale
2 cm = 0 1 µg/dL on X Axis
1 cm = 0 03 µg/dL on Y Axis
Absorbance (µg/dL)
0 39
0 36
0 33
0 30
0 27
0 24
0 21
0 18
0 15
0 12
0 09
0 06
0 03
0 00
0 2
0 4
0 6
0 8
1 0
Concentration (µg/dL)

APPENDIX X

Estimation of Total Iron Binding Capacity

Principle

The iron in serum is bound to the protein transferrin (siderophilin) Normally this protein is about one third saturated with iron (serum iron) The additional quantity of iron which can be taken up by the transferrin is termed the unsaturated iron binding capacity (UIBC) The total quantity of iron in serum after the complete saturation of the tranferrin is the total iron-binding capacity (TIBC)

To determine the UIBC an excess of iron is added to the serum Under favourable conditions (pH 8 3) the transferrin becomes saturated with iron within a short period of time After reduction, the unbound iron is converted into a red compound by a specific iron reagent (sulfonated bathophenanthroline) and determined photometrically The difference between the iron added and the unbound iron after saturation is the unsaturated iron binding capacity (UIBC)

The sum of UIBC and the iron concentration of the serum equals the total iron binding capacity (TIBC)

Reagents

[1] Buffer

(1 0 mol/litre, tris (hydroxymethyl) aminomethane pH 8 3)

[2] Reduction solution

(30 m mol/litre, methyl aminophenol sulfate, 162 m mol/litre sodium hydrogen sulfite)

[3] Colour reagent

(1 7 mmol/litre bathophenanthroline disulfonic acid, disodium salt)

[4] Iron standard solution

(2 5 mg/dl)

Procedure

Before use, the glassware must be thoroughly cleaned (especially prior to the first use) Preferably, leave the glassware overnight in chromosulphuric acid or in the case of stubborn impurities heat in a 5/ solution of EXTRAN, for one hour at 95°C, and rinse thoroughly with redistilled water

Maximum absorbance 535 nm

Pipette into test tubes.

	Serum blank	Sample	Reagent blank
Serum	1 0 ml	1 0 ml	–
Buffer [1]	0 5 ml	0 5 ml	0 5 ml
Standard solution[4]	0 2 ml	0 2 ml	

Mix well, cover the tubes, and place in a water bath at 37°C or 45°C for 10 minutes

Reduction solution [2]	0 2 ml	0 2 ml	0 2 ml
Redistilled water	0 2 ml	–	1 0 ml
Colour reagent [3]		0 2 ml	0 2 ml

Mix well, cover the tubes, and place in a water bath at 37°C for 180 minutes or in a water bath at 45°C for 90 minutes Cool to room temperature and measure the absorbance of the sample against the reagent blank and the absorbance of the serum blank against redistilled water

APPENDIX XI

Packed Cell Volume

Principle

The packed cell volume (PCV) or haematocrit / of blood is determined using heparinised capillary tubes (75 X 1mm) and microhaematocrit centrifuge

Procedure

Blood from the finger tip or collected in EDTA is allowed to run about 1/2 to 3/4th length of the tube The tube is sealed on the opposite end using sealing wax or plasticine The tubes are then transferred to the high speed microhaematacrit centrifuge, and placed in grooves of the centrifuge head They are centrifuged for 5 min at 11,000 rpm and read on the reader which gives the direct haematocrit value in volumes per cent

APPENDIX XII

Nutritional Status Index (NSI) of the respondents

SL NO	AGE (YRS)	NUTRITIONAL STATUS INDEX
1	21	75 02
2	20	74 18
3	30	75 20
4	30	73 47
5	25	74 91
6	24	72 35
7	21	73 79
8	21	74 37
9	27	71 23
10	30	75 00
11	28	72 32
12	25	74 30
13	21	73 60
14	22	73 60
15	28	74 62
16	22	76 16
17	20	73 07

SL NO	AGE (YRS)	NUTRITIONAL STATUS INDEX
18	22	75 25
19	20	69 27
20	25	72 17
21	24	73 07
22	20	74 26
23	20	73 12
24	28	76 19
25	25	74 29
26	23	76 16
27	22	74 80
28	26	75 41
29	28	72 94
30	23	73 92
31	20	75 62
32	30	74 54
33	25	73 93
34	28	74 49
35	26	75 91
36	30	72 87
37	25	76 24
38	27	69 63
39	20	72 25
40	20	69 42

SL NO	AGE (YRS)	NUTRITIONAL STATUS INDEX
41	23	71 16
42	22	72 34
43	20	70 07
44	25	69 68
45	22	75 56
46	24	73 28
47	20	73 69
48	20	73 39
49	30	74 09
50	30	72 03
51	30	75 60
52	26	73 72
53	28	74 88
54	30	74 18
55	25	71 92
56	28	75 62
57	24	63 75
58	22	76 38
59	23	73 49
60	23	75 97
61	20	72 31
62	21	72 32
63	22	75 79

SL NO	AGE (YRS)	NUTRITIONAL STATUS INDEX
64	22	74 19
65	25	77 95
66	21	74 53
67	20	75 75
68	28	75 36
69	20	74 98
70	29	78 03
71	25	74 03
72	20	74 04
73	30	75 68
74	20	74 06
75	30	73 34
76	20	72 33
77	20	72 54
78	25	72 24
79	27	69 93
80	30	75 68
81	20	71 16
82	30	71 97
83	28	74 19
84	30	76 29
85	23	72 11
86	20	74 89

SL NO	AGE (YRS)	NUTRITIONAL STATUS INDEX
87	24	72 46
88	30	72 96
89	20	71 50
90	20	73 84
91	20	75 36
92	23	76 17
93	25	76 05
94	21	71 15
95	25	72 23
96	20	73 30
97	20	73 88
98	24	73 85
99	22	73 73
100	24	74 67

APPENDIX XIII

Working efficiency of the respondents

SL NO	Number of baskets (work output) per week	Hours per week	Working efficiency
1	16	20	0 8
2	20	45	0 44
3	20	40	0 5
4	16	32	0 5
5	20	40	0 5
6	16	28	0 67
7	20	40	0 5
8	16	36	0 44
9	16	20	0 8
10	12	21	0 67
11	12	28	0 43
12	16	24	0 67
13	16	20	0 8
14	12	21	0 67
15	8	24	0 3
16	16	24	0 67

SL NO	Number of baskets (work output) per week	Hours per week	Working efficiency
17	16	45	0 36
18	16	45	0 36
19	15	40	0 38
20	20	40	0 5
21	20	40	0 5
22	20	40	0 5
23	12	32	0 38
24	16	28	0 57
25	16	28	0 57
26	15	40	0 38
27	16	32	0 5
28	16	20	0 8
29	12	32	0 38
30	20	35	0 57
31	16	28	0 57
32	9	24	0 38
33	16	32	0 5
34	16	32	0 5
35	6	24	0 25
36	16	28	0 57
37	16	32	0 5

SL NO	Number of baskets (work output) per week	Hours per week	Working efficiency
38	9	24	0 38
39	15	35	0 43
40	20	35	0 57
41	20	30	0 67
42	16	28	0 57
43	12	24	0 5
44	16	24	0 67
45	16	28	0 57
46	12	28	0 43
47	16	24	0 67
48	20	40	0 5
49	15	20	0 75
50	20	25	0 8
51	12	32	0 38
52	12	28	0 43
53	26	35	0 57
54	20	40	0 5
55	20	40	0 54
56	20	40	0 5
57	20	35	0 57
58	16	24	0 67
59	12	28	0 43

SL NO	Number of baskets (work output) per week	Hours per week	Working efficiency
60	20	40	0 5
61	20	35	0 57
62	15	35	0 43
63	12	32	0 38
64	16	32	0 50
65	16	28	0 57
66	25	40	0 63
67	15	40	0 43
68	16	32	0 5
69	16	32	0 5
70	16	24	0 67
71	20	28	0 71
72	16	32	0 5
73	20	35	0 57
74	16	32	0 5
75	16	28	0 63
76	16	24	0 67
77	16	24	0 67
78	20	30	0 67
79	20	30	0 67
80	15	40	0 43

SL NO	Number of baskets (work output) per week	Hours per week	Working efficiency
81	20	30	0 67
82	20	35	0 29
83	8	28	0 25
84	8	32	0 5
85	20	40	0 57
86	20	35	0 33
87	10	30	0 29
88	10	35	0 5
89	16	32	0 5
90	16	32	0 38
91	15	40	0 67
92	20	30	0 5
93	20	40	0 5
94	16	32	0 43
95	12	28	0 43
96	16	32	0 5
97	20	40	0 5
98	20	40	0 5
99	16	36	0 4
100	20	40	0 5

FACTORS INFLUENCING THE WORKING EFFICIENCY OF WOMEN ENGAGED IN STONE BREAKING WITH SPECIAL REFERENCE TO NUTRITIONAL STATUS

BY

JYOTHI AUGUSTINE

ABSTRACT OF THE THESIS

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ABSTRACT

A study on the Factors influencing the working efficiency of women engaged in stone breaking with special reference to the nutritional status was taken forth to evaluate the socio economic and food consumption pattern of the families, personal characteristics, working pattern, energy balance and nutritional status of the respondents

Of the families surveyed majority belonged to underprivileged communities with nuclear type families comprising about 5 10 members Almost all the respondents were literates having basic education The main bread winner of these families were found to be females including the respondents The per capita income of majority of the families ranged between Rs 100/ to Rs 200/-

The families surveyed were habitually non-vegetarians The major proportion of the families income was incurred for food especially staple food articles Ri e, fish along with some vegetables composed the major ingredients in their dietaries Three meal-a-day pattern was followed by majority of the families

Working conditions of the respondents were, longer hours of work without adequate rest meagre wages, hazardous and risky conditions affecting their health and well being

Energy balance showed a negative trend in the case of almost all the respondents

Intake of major nutrients viz energy, vitamin A, vitamin B_2 and vitamin C was found to be inadequate which resulted in their low body weights and prevalence of nutritional disorders particularly anaemia The respondents negative iron status reflected in their low cardiac abilities and poor physical endurance In the present study, working efficiency of the respondents showed no association with their Nutritional Status Index (NSI) developed Regarding the various factors influencing the respondents working efficiency, only their monthly income and resting hours in between their work showed a significant correlation with working efficiency