NUTRITIONAL CHALLENGES OF MANUAL SCAVENGERS IN SELECTED BLOCKS OF COIMBATORE

By

PRIYADHARSHINI, A.

(11PD16)

A THESIS SUBMITTED TO THE

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND

HIGHER EDUCATION FOR WOMEN

COIMBATORE - 641 043.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN

FOOD SERVICE MANAGEMENT AND DIETETICS

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CERTIFIED AS A BONAFIDE RESEARCH WORK

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Signature of the Head of the Department

Signature of the Guide

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I. INTRODUCTION

Over 60 years of independence, India is still a country in developmental transition and continues to battle with infectious diseases and conditions related to under nutrition.

Based on the monthly per capita consumption expenditure (MPCE) of Rs 673 for rural areas and Rs 860 for urban areas, about 30 per cent of people in India were below the poverty line in 2009-10. The percentage of people living below poverty line in the country has been estimated as 29.8 per cent, (Rajeev shukla, Minister of state for parliament).

Over 50% of preschool children and 30% adults are undernourished as judged by anthropometric indices and over 70% of women and children suffer from anemia. Every third child is born with low birth weight, and may have impaired mental and physical development and immunity.

Poverty, illiteracy, inequality, population explosion and environmental factors are the contributing factors to poor health status.

According to WHO (2010) Health is a state of complete physical, mental and social well being and not merely the absence of disease or infirmity.

Health is considered one of the most important components of human resource development. A healthy human being constitutes to the nations productivity both quantitatively and qualitatively (Hansa Jain, 2010).

Burden of infectious and non-infectious diseases is very high in India, due to poor environmental sanitation, water scarity, particularly potable water, and poor personal hygiene. Illness affects nutrition through “reduced intake and impaired absorption, catabolic loss due to low productivity”. Despite expanding economy, India remains a ‘museum of Pathology’.

Purchasing power is necessary to access food and nutrition security. Thus poor tend to be more undernourished than the rich. However, malnutrition is not confined only to the people below the poverty line but also

undernourished. Hidden hunger is seen even in the so called well-to-do and 'safety measures are need of the day for them as well. According to FAO estimation rising food prices have plunged an additional 75 million people below the hunger threshold.

According to FAO, 2012 reports, exactly 870 million people in the world do not have enough to eat. This number has fallen by 130 million since 1990, but progress slowed after 2008. It also states that majority of hungry people (98%) live in countries like India, China, Pakistan etc., where almost 15% of the population is undernourished.

As per the projection of a recent survey of the NNMB (National Nutrition Monitoring Bureau 2009) in nine states 7.8 percent Men and 10.9 percent Women have various health related problems, like anemia, obesity, hypertension, micro and macronutrient deficiency and life style disorders like diabetes and cardiovascular diseases.

According to NFHS survey (2006) prevalence of anemia was 55.3 per cent among women of reproductive age and 53.2 per cent in non-pregnant non-lactating women in India.The prevalence of anemia is high because of low dietary intake and poor sanitary conditions. (Lancet, 2006).

About 20%-40% of maternal deaths in India are due to anemia. India alone contributes to about half of the global maternal deaths due to anemia. Poor bio-availability of iron (3-4 % only) inphytate fiber rich Indian diet and chronic blood loss due to infection such as malaria and hookworm infestations are the main causative factors for anemia.

Vitamin A deficiency still remains a significant public health problem at the global level. It is estimated that 33%(190 million) of preschool children and 15% (19 million) of pregnant women do not have enough vitamin A in their daily diet, and hence are the victim of this major nutritional problem (WHO, 2009).

Of the life style disorders, overweight or obesity is the leading cause of type 2 diabetes, hypertension, osteoarthritis, various types of cancers, menstrual disorder, infertility and many more diseases. The incidence of undernutrition and overweight/obesity are both on a higher end for women than men.

Diabetes is considered, as a major healthcare problem in India. According to International Diabetes Federation, (2007) 40 million peoples are suffering from diabetes in India. According to National Diabetes Statistics (2011), 25.6 million in the age group of 20 years is diabetics.

A total of 17.3 million estimated people died from cardio vascular diseases in 2010. Over 80% of cardio vascular disease deaths takes place in low and middle income countries. Coronary heart diseases was a leading cause of death in India, leading to 1.46 million deaths (14 per cent out of a total of 10.3 million deaths) and 130.7 deaths per 100,000.

Life style is a complex interacting set of attributes not amenable to reductionist analysis. Besides physical activity and diet there are other life-style related factors such as migration, urban rural living, work environment, loss of sleep, abuse of alcohol, tobacco and recreational drugs, which lead to the onset of multiple diseases and disorders. The rural to urban migration has resulted in a fall in energy expenditure.

One of the important life style related factors that contribute substantially to malnutrition (often over nutrition) and chronic diseases are occupational hazard. They are the significant contributors of global health burden to the society.

The most unsafe occupation identified to pose a great risk and challenge to the citizen of India are Information technology (IT) industry, textile industry, fertilizers and chemical industry and manual scavenging.

Even after 60 years of Independence, manual scavenging or cleaning human wastes from toilets is only the most demeaning of the jobs that India's underprivileged section of population are forced to perform to earn a living.

Everyday nearly two million people in India are forced to scavenging manually. According to the census of India (2011), there are still 7, 94,390 dry latrines in the country where human excreta is cleaned up by humans. The country has nearly 7, 94.390 dry latrines in use, 60 percent are in urban areas, and 40 percent in rural areas.

Manual scavengers exists in many states in India. Tamil Nadu is also one of the states which has a high population of the manual scavengers. They are oppressed, depressed and the poorest among the poor in the Indian Society. In Tamil Nadu, manual scavengers are densely concentrated in the western districts namelyCoimbatore, Erode, Tirupur, Karur, Namakkal, Salem and Dharmapuri districts and loosely spread over in the other parts of the state. There are about 60,00,000 manual scavengers in Tamil Nadu. They are also identified with different names such as Chakkliar, Thoti, Madiga, Pagadai, AdiAndra, Madiga and Madari in Tamil Nadu, Karnataka and Andhra Pradesh.

Apart from manual scavenging they are also compelled to do very menial low dignified/undignified jobs, death messages for upper caste community, dead body burials, dead cattle removal, drum beating in upper caste death funerals etc., in the society. Poor living conditions, desperate search for a dignified livelihood and decent wages,constant exploitation and harassment from moneylenders and upper caste landlordsare part of the day-to-day life of an manual scavengers.

Manual scavengers work is very difficult and unhealthy. Life of Manual scavengers is at risk at every stage. The working conditions of those sanitary workers have remained virtually unchanged for over a century.

Manual scavengers face certain health problems by their occupation. These health hazards include exposure to harmful gases such as methane, and hydrogen sulfide, cardio vascular degeneration, musculoskeletal disorder like osteoarthritis, changes and inter vertebral disc herneation, infections like hepatitis, leptospirosis and helicobacter skin problems, respiratory system problems like asthma, diarrhoea and altered pulmonary function parameters.

Workplace injuries contribute significantly to the global burden of diseases (Murray, 1996). The scavengers and sewage workers suffer mainly from chemical and biological hazards. Manual scavengers confront a dual risk of exposure to harmful pathogens through their environment as well as their occupation. In addition to frequently residing in areas without safe water or adequate sanitation, scavengers are consistently exposed to both human and animal waste during the manual removal of solid waste and excreta from latrines, roads, septic tanks and open areas used for defecation.

Inspite of exposure to various health hazards, the working condition of these sanitary workers have remained virtually unchanged for over a century. Apart from the social atrocities that these workers face, they are exposed to certain health problems by virtue of their occupation. Though many social organization have addressed their health hazards, the actual health and nutritional status of this underprivileged population is rarely explored.

Understanding the food and nutritional requirement of this deprived sector will help in focusing the require inputs to uplift their health and nutritional status. Thus as a primitive step, the investigator has taken up this research work titled, "Nutritional challenges of manual scavengers in selected blocks of Coimbatore" with the following objectives.

General objective:

To study the nutritional challenges of manual scavengers in selected blocks of Coimbatore

Specific objective:

The specific objective of the study is to

- Understand the demographic profile of the selected manual scavengers.
- Study the life-style and dietary habits of the selected manual scavengers.
- Assess the nutritional status of the selected manual scavengers and
- To correlate the factors relating to their nutritional status of the selected manual scavengers.

II. REVIEW OF LITERATURE

The literature pertaining to the study **"Nutritional Challenges of Manual Scavengers in Selected Blocks of Coimbatore"** is presented under the following headings:

D. Health status of India - A Review

E. Nutritional and life style challenges – current scenario

F. Manual scavengers and their status of India

A. Health status of India – A Review

Health is also important entitlement that enhances "capabilities" of the poor people leading to increase in 'commodities' and further improvement in health status (Bloom, 2004).

Ankita Chakrabarty (2011), The causes of deaths in the 25-69 years age group – urban and rural areas taken together - are respiratory diseases such as asthma (10.2 percent), tuberculosis diseases (5.1 percent) and diarrheal disease (5 percent). Malaria Which had been a leading cause of death, now accounts for only 2.8 per cent deaths.

Health poverty is said to exist when the country or region has poor life expectancy at birth, high infant and child mortality rate, and the presence of various types of contagious and non-contagious diseases. The other aspects of deprivation such as lack of access to critical amenities including safe water, sanitation, non – polluting domestic fuels, connectivity to life support, and most importantly to education and general awareness contribute to reinforcing ill health and morbidity, even leading to higher mortality levels (Hansa Jain, 2010).

Nearby 100 million people live in urban slum, with little or no access to portable water, sanitation facilities and health care service. This contributes to high infant and child mortality, which in turn perpetuate high total fertility rate and maternal mortality (Goal, 2011).

In India, rural areas of poorer states like Uttar Pradesh and Bihar, the leading cause of death among middle aged males is cardiovascular disease.(Prabhat Jha, 2011).

India is accounted for non communicable diseases, while communicable diseases and those associated with child birth and nutritional disorders account for 38 per cent of deaths (Prabhat Jha, 2011).

Proper nutrition helps to ensure the body to stays healthy and to experience quality life without any major health problems. Poor nutrition can be defined as a lack of essential vitamins or minerals or an excess amount of unhealthy nutrients or substances. Poor nutrition causes a variety of different health problems in both adults and children (Lindsay Boyers, 2010).

Low BMI and high levels of under nutrition (based on BMI) are the major public health problems especially among rural underprivileged adults of developing countries (WHO, 1995).

Under nutrition, reduces immunity and infections reduce appetite, impair absorption and lead to catabolic losses of precious nutrients. Thus access to clean environment and drinking water to prevent infections are areas of great concern. Increasing prevalence of obesity and chronic diseases is due to more sedentary lifestyles, shift to less fiber, high fat refined carbohydrate diets, stress and addictions (Indian National Science Academy, 2009).

India being a developing nation is faced with traditional, public health problems like communicable diseases, malnutrition, poor environmental condition and inadequate medical care. However, globalization and rapid industrial growth in the last few year has resulted in emergence of occupational related issues. Due to implementation of industrial regulations, child labor, poverty and unemployment are more rampant in the country.

Most of the disease burden in rural India is due to the respiratory disorders namely asthma, bronchitis & tuberculosis (TB) and pneumonia. In low resource settings these diseases are mainly attributed with exposure to

indoor pollution, solid-cooking fuels, poor housing, low nutritional status and sanitary conditions (Dayal, 2007)

The association of respiratory disorders with geographical region may be relevant with population density, industrial and textile pollutants, and tobacco consumption. The relationships between socio-economic developments, behavioral and environmental factors of these diseases were well premeditated (Smit, 2000).

Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations; the prevention among workers of departures from health caused by their working conditions (Anita Choudary, 2012).

B. Nutritional and life style challenges – current scenario

Increasing food prices will make fighting micronutrient malnutrition in developing countries more difficult. In societies where preference is given to males in the intra house-hold distribution of non staple foods, this objective will be even more challenging (Rahman, 2011).

Low BMI and high levels of under nutrition (based on BMI) are the major public health problems especially among rural underprivileged adults of developing countries. WHO,1995. BMI is generally considered a good indicator of not only the nutritional status but also the socio economic condition of a population, especially adult populations of developing countries (Shetty and James, 1994).

According to the anthropometric indicator of BMI, 49% of the urban women in India (aged 15-49years) are either underweight or overweight. This population is higher than the overall prevalence of malnutrition (both underweight and overweight) among urban men (42%).

Hard and unfavorable occupations also seen as asthma prone, the rural occupation stone crushing is largely risky. (Husain,1991)

If the laborers are children they are more prone to asthma (high asthma rates are found among children who works in sivakasi fire work industry (Saha, 1994).

Asthma and bronchitis takes major toll in India, it has recorded to be highest in Karnataka and lowest in Punjab. These chronic diseases are more predominant in children and aged population, causes are not very well known. Major causative agents implicated are pollen grains, fungal spores, dust mites, insect debris, animal epithelia (Singh, 2003).

Several environmental factors like poor housing conditions, dust mite, bed dust allergy may also be seen as association.(Mesquita,1995).

Nutritional problems in India have their roots in poverty and inequality. Poverty which restrains an individual or family to establish command over "commodity bundles with enough food" and inequality which among other things places a disproportionate burden of ill-health and under-nutrition on women and children. (Sen, 1981)

Considerable morbidity exists due to chronic interdependent nutritional problems. Nutritional deficiencies are known to co-exist and have a common cause, i.e. lack of food and superimposed infections and infestations. It has generally been accepted that the infection, usually in the form of diarrheas – leads to poor nutrition status. Energy and iron intakes on Indian diets are highly correlated. Apart from inadequate content of iron, reduced intake of food which is widely seen among the poor in the country further reduces daily iron intake. This is particularly so among young children, women and pregnant women (Superna Goel, 1993).

In India, Venkatachalam and Gopalan (1993), reported that 36 per cent of Kwashiorkor cases in Coonoor in the State of Tamil Nadu and 32 per cent of those seen in Hyderabad in the State of Andhra Pradesh had associated Xerophthalmia.

Data from NNMB and INP (2002), shows that prevalence of under-

nutrition in adults is higher in rural areas, as compared to urban areas. Prevalence of over nutrition is higher in urban areas. Over the last three decades there has been a progressive decline in under nutrition and some increase in over-nutrition both in urban and in rural areas.

Low socioeconomic status (SES) is associated with increased mortality from cardiovascular disease, cancer and trauma (Michael Leitzmann et al., 2011).

Lifestyle pattern of the adults revealed that habits such as smoking, alcohol, tobacco and lack of exercise were more common among adults with higher levels of blood pressure. (Lakshmi et al., 2011).

Stern et al., (2006), shows that early exposure to parental smoking may be associated with an increased risk of diabetes and perhaps hypertension and the metabolic syndrome.

William Duquet et al. (2007), found that in men, alcohol consumption and smoking in the past are also among the lifestyle factors associated with overweight.

Sundell et al., (2008) reported that heavy alcohol consumption triggers cardiac arrhythmias which increased the risk for ischemic stroke due to cardiogenic embolism with a predisposing high-risk referring to atrial fibrillation, myocardial infarction together with cardiomyopathy.

The prevalence of type 2 diabetes mellitus has increased dramatically in the past decades and is estimated to double from 171 million people in 2000 to 366 million in 2030 (King et al., 2004). The majority of diabetes cases could be prevented by changes in lifestyle and diet (Peltonen, et al, 2006) .

Adults in India suffer from a dual burden of malnutrition (abnormal thinness and overweight or obesity). Almost half of Indian women age 15-49 (48 percent) and 43 percent of Indian men age 15-49 have one of these two nutritional problems (Monica Kothari, 2009).

Forty-three percent of children under age five years are underweight for their age three. Underweight status is a composite index of chronic or acute malnutrition. Underweight is often used as a basic indicator of the status of a population's health. (WHO Child Growth Standards).

In developing countries, under-five mortality is largely a result of infectious diseases and neonatal deaths. Under nutrition is an important factor contributing to the death of young children. If a child is malnourished, the mortality risk associated with respiratory diarrhea, malaria, measles, and other infectious diseases is increased (Habicht et al. 1994).

The low dietary intake of iron and folic acid coupled with poor bioavailability of iron is the major factor responsible for very high prevalence of anemia in the country. Anemia is associated with increased susceptibility to infections, reduction in work capacity and poor concentration. Anemia remains to be major cause of maternal mortality and low birth weight in India (NNMB 2003).

Nutritional requirement is defined as the amount required to balance nutrient expenditure consistent with long-term good health. This intake will allow for maintenance of economically necessary and socially desirable physical activity. Nutrient requirements are determined by body size and composition and level of physical activity. (Planning Commission 2001).

According to the NFHS, 10 percent of India's population was either overweight or obese in 2006. Overweight or obesity is the leading cause of type 2 diabetes, hypertension, osteoarthritis, various types of cancers in women like breast cancer and uterus cancer, menstrual disorder and infertility and many more diseases. Under nutrition and overweight/ obesity are both higher for women than men (Jayashree Sachin Gothankar, 2003).

Patnaik (2010), in his study on Hypertension in Urban Slum of Brahmapur, Orissa on 336 persons above 18 years of age found higher prevalence of hypertension in persons with BMI >25.

Sandeep (2003), in a community based cross sectional study in urban slum area of Ankoli, Brahmapur done on 332 persons found Hypertension was significantly higher in persons of more than 40 years age, with BMI>25 (P<0.001).

C. Manual Scavengers and their status

Manual Scavenger: means a person engages in or employed for manually carrying human excreta and the expressions “manual scavenging” and “unliberated scavenger” constructed accordingly. (Dak, 2007).

According to the World Health Organization, sanitation “refers to the provision of facilities and services for the safe disposal of human urine and faces”.

UNICEF’s working definition of social exclusion “By social exclusion we mean the everyday social processes which groups of the people are denied rights to participate fully in their societies, leading to material and other forms of deprivation.

The low level of sanitation in India today is a matter of grave concern. Widespread lack of access to facilities for the disposal of human waste leads to contaminated water and land, in turn causing illness in millions of people. Gol (Government of India, 2007) estimates that, on an average, 30 million people in rural India are afflicted with illness as a direct result poor sanitation. (Ajay Singh, 2007).

Scavenging is problematic in three major ways; first, it causes health complications; second, it contributes to discrimination against the castes who work as manual scavengers; and third, it contributes to the scavengers’ own sense of shame and degradation (Katha Kartiki, 2008).

Many [manual scavengers] reported how at the age of eight or eleven they were introduced to this work; how for many days they could not bring food to their lips; how the stench of shit was constantly in their nostrils; how their intestines retched; how they were constantly spitting out the shame and

the indignity. It is a sadder fact that the majority of manual scavengers are women. (Bezwada Wilson, Convener, Safai Karamchi Andolan, 2009)

The occupation of Manual Scavenging has its roots in the caste system, which renders the community invisible and powerless. (Raashtriya Garima Abhiyan, 2007)

The group of scavengers is placed lowest in caste-based hierarchy. Its members are bound not only by traditional obligations and customary rules to practice this ubiquitous occupation but mythological sanctions also oblige them to carry night soil physically for disposal. Everyone borne in the sub-caste of scavengers is destined to take up this subhuman profession (Phatak, 1991).

Stephen Fuchs,(1998) placed them at the bottom of Indian society i.e. lowest of all low castes. Despite, they are not without some social gradation: some are considered superior to others, their rank being determined by the respective origin, and the type of work they perform. The lowest place is occupied by those who manually clean latrines where scavengers come in direct contact with human excreta. The scavengers cleaning latrines are grossly underpaid, quite often abused and living a life of degradation.

In many rural parts of India the scavengers, using a small tin plates, scoops raw faecal matter from the dry latrine (essentially a clay pot, built into the side of the house), and then pours the waste into a large basket lined with leaves. Once filled, the baskets are carried, often on the scavenger’s head, and the contents are dumped in a designated location. (Katha Kartiki,2008).

Naradiya Samhita mentions disposal of human waste as one of the 15 duties of slaves from the ancient time on the terms Chandal and Paulkasa refers to those who are engaged in the task of the disposal of night soil (Nagar, 1980). The Scavengers and sweepers were known to clean the city and disposal of night soil in Patliputra during Maurya Period to dating bad history. It is believed that warriors who were defeated in the battle and made captives were forced to perform scavenging work (Malkani, 1960 and Dak, 2007).

Government of India has launched the National Scheme of Liberation and Rehabilitation of Scavengers and their Dependents (NSLRS) since 1992. The objective of the scheme is to liberate the scavengers from their existing hereditary, obnoxious and inhuman occupation of manually removing night soil and filth and to provide for and engage them in alternative and dignified occupations through provision of facilities, loans and grants (Dak, 2007).

Cleaning of dry latrines and transporting of human excreta has been banned since 1993, Under the 1993 Act, the employment of scavengers or the construction of dry latrines can result in imprisonment up to one year and /or a fine of Rs2000. Offenders are also liable to prosecution under the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989. Despite such laws, manual scavenging continues. By April 2002, sixteen states had adopted the 1993 Act, which include Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Harayana, Punjab, Tamil Nadu, Tripura, Uttar Pradesh, Maharashtra, Orissa, Jharkhand, Karnataka, and West Bengal.

Despite laws banning dry latrines and the transport of human excreta, thousands of people still make their living this way, sometimes working even in government departments. The social structure also forced nearly all of this work on Dalit women and girls (Kumar, 2006).

Women working unprotected are in grave danger of contacting countless diseases through their daily and close contact with human waste. Some of these diseases, in addition to TB, include: campylobacter infection, cryptosporidiosis, giardiasis, hand, foot and mouth disease, hepatitis A, meningitis (viral), rotavirus infection, salmonella infection, shigella infection, thrush, viral gastroenteritis, worms and yersiniosis.

Institutions like the Indian Railways, the Municipal corporations and Gram Panchayats employ manual scavengers on contract bases. The Indian Railways is the major employer of manual scavengers, and manages some of the longest rows of open latrines in the world (Rashtriya Garima Abhiyan, 2007).

The Scavenger and sewage workers suffer mainly from chemical and biological hazards. This can be prevented through engineering, medical and legislative measures (Rashtriya Garima Abhiyan, 2007).

Manual scavengers should also be benefitted from occupational health services, which should include pre placement and periodic health monitoring. Further effective implementation of the Employment of Manual Scavengers and construction of dry latrines (Prohibition) Act, 1993, will help in the abolition of manual scavenging. Also regular awareness programs should be conducted to impart education regarding safer work procedures and use of personal protective devices. (Rashtriya Garima abhiyan, 2007).

Working condition of the sanitary workers have found to remain unchanged over the years and pose a considerable risk to the dignity and health of the workers.

The workers are commonly exposed to gases like hydrogen disulfide, methane, ammonia and carbon monoxide. Walt et al. studied 26 sewer workers exposed to smell are found that 53.8% developed sub-acute symptoms including sore throat cough, chest tightness breathlessness, thirst, sweating, irritability and loss of exposure to hydrogen sulfide in 68 sewer workers found that the FEV/FVC values were lower in sewer workers who had a high hydrogen sulfide exposure.

Hydrogen sulfide is a flammable gas, which burns with a blue flame, giving rises to sulfur dioxide, a highly irritating gas with a characteristic odor. Mixture of hydrogen sulfide and air in the explosive range may explode violently. (Navasrajan, 2009).

According to Samuvel, (2012) Tiruvallur district (Tamil Nadu) has 3,144 households that rely on manual scavenging and 2,687 households that rely on pigs to eat night soil. Kanchhepuram is second on the list, with 2,108 toilets serviced by animals. The situation is bad mainly in, the town panchayats. In Tiruvallur district, areas like Avadi, Ambattur Estate and Poonamallee have many dry toilets that are cleaned manually.

The sanitary workers use a brush to scoop excreta into baskets or plastic bags, pour water over the patch and sprinkle bleaching power to prevent infections. “Many of them develop tuberculosis and lung infections repeatedly and die at an early age. In some cases they suffocate while doing their work”. The government had promised their children jobs in the municipalities as compensation, but has given them the same jobs as their parents. Chennai has 463 toilets cleaned by people and 576 cleaned by animals. (Vasundra, 2012).

III. METHODOLOGY

The methodology pertaining to the study entitles**“Nutritional Challenges of Manual Scavengers in Selected Blocks of Coimbatore”,** is illustrated in Figure 1 and discussed under the following headings:

D. Selection of area
E. Selection of sample
F. Collection of data and conduct of the study

A. Selection of Area

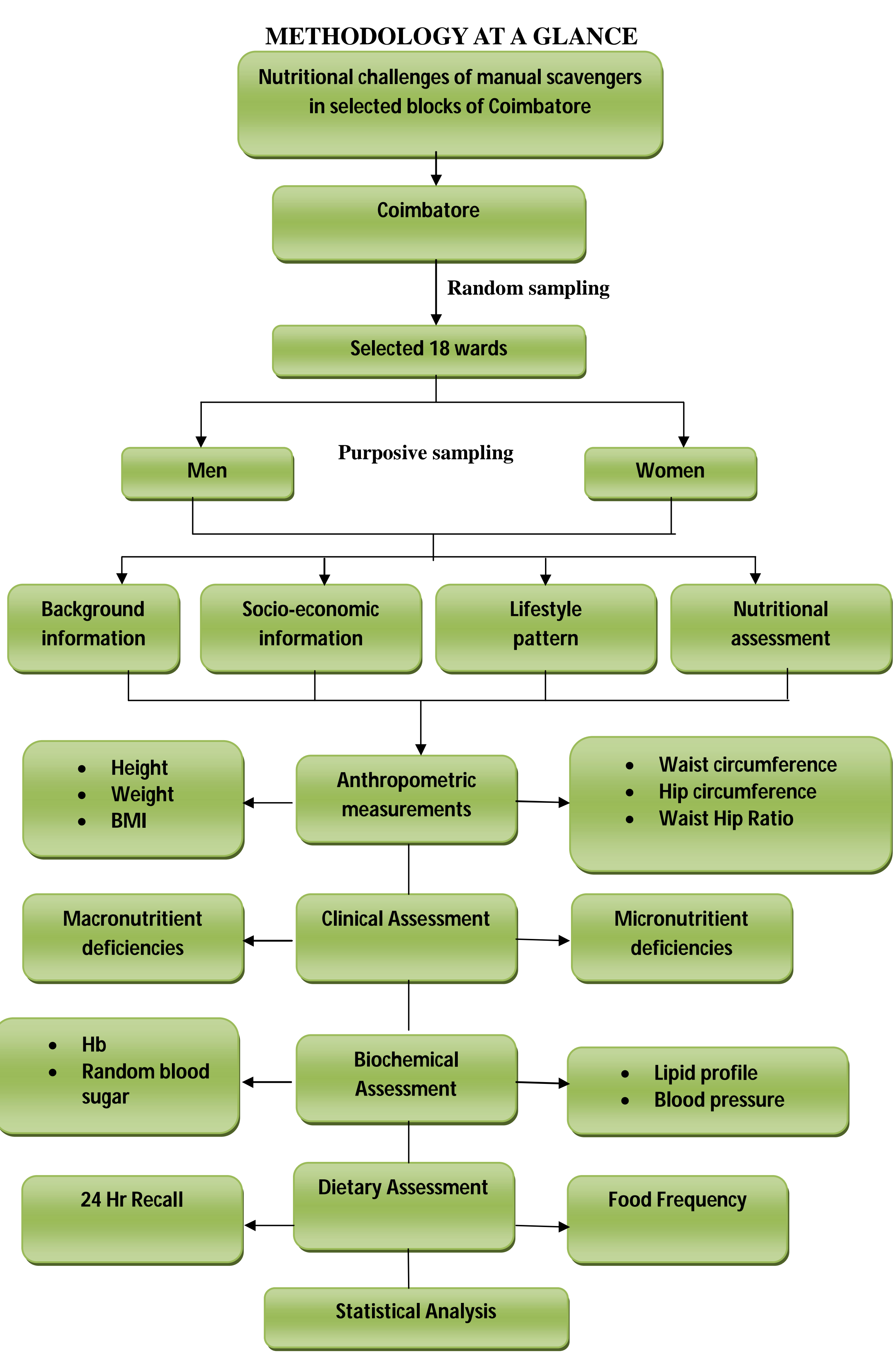
Inspiteof nationwide call for eradication of manual scavenging practice, nearly 2-3 lakh people are still involved in manual scavenging.According to the 2011 census reports there are 27,659 toilets that are serviced manually by human being. Coimbatore a city of Tamil Nadu is also no exceptional for this current status.

People involved in manual scavenging in any part of the country despite of poor right to quality of living, they are prone to more health issues and nutrition deficiencies. Since data pertaining the health and nutritional challenges of these underprivileged is rarely explored, the investigator selected, to study the “nutritional challenges of manual scavenger in selected blocks of Coimbatore”.

B. Selection of Sample

Coimbatore Corporation by itself consists of 100 wards, out of 100 wards, each ward has a set of manual scavenger who take care of the cleanliness of area allotted. Manual scavenging is a practice by which people remove excreta from public and private dry latrines and carry them to dumping grounds and disposal site.

METHODOLOGY AT A GLANCE



Thus out of 100 wards under corporation limits, 18 wards were randomly selected for the conduct of the study. In random sampling, subjects were selected in such a way that every item in the population has an equal chance of being included (Kothari, 2004).

Both men and women involved in the manual scavenging were selected through purposive sampling from the 18 wards. Purposive sampling is a sampling procedure which does not afford any basis for estimating the probability that each item in the population has of being included in the sample. (Kothari, 2004)

C. Collection of data and conduct of the study

A well structured interview schedule was developed by the investigator to collect the following information.

Background information

BackgroundInformation for age, sex, education and occupational status, working hours, Income and wage details were elicited from the manual scavengers using a well structured interview schedule.

The family history

The family history for type of family, number of family members, and their status of children for education and employability wasalso collected with the help of an interview schedule, to have an idea about the accessibility for educational and employment of these children in the society.

The socio economic status

To get an insight into their quality of living, using pre-tested interview schedule the socio economic details pertaining to place of dwelling, housing facilities, provision for safe drinking water and toilet facility were also studies.

Nutritional assessment

To ascertain the nutrition challenges of the selected manual scavengers, a nutritional assessment was done by the investigator. Nutritional assessment is an in-depth evaluation of both objective and subjective data related to individuals food, their nutrient intake, lifestyle, and medical history. Thus the following parameters were assessed to understand their nutritional problems and their needs.

Anthropometric measurements

Weight and height are prominent indicator of health and wellbeing. Thus anthropometric measurements for height, weight, waist and hip circumference were measured for all the selected two hundred manual scavengers using appropriate equipment. The BMI (Body Mass Index) and the WHR (Waist to Hip Ratio) were also calculated.

Height

The height of an individual is influenced by both genetic and environmental factors. The maximum growth of an individual is derived by hereditary factors.The selected subjects were made to stand against the wall on a levelled surface without shoes and toes apart. The foot long ruler was placed on the person's head and a mark was made on the wall, at the point of contact between the wall and the ruler. Using a non-stretchable measuring tape, the distance from the floor to the mark on the wall was measured. Then height was taken the nearest ¼ inch or 0.5 centimetres. The actual height of the manual scavengers was compared with the ICMR (2009), standard of height for age.

Weight

Body weight is the most important anthropometric measurement. Using a bathroom weighing scale, the weight was measured for all the subjects. The subjects were asked to stand on the platform of weighing scale without foot wear and with minimal clothing. The individual were asked not to lean against a wall or hold any support,while the weight was measured. The weighing scale

was calibratedto 0.0 prior to the measurement and the weight was recorded to the value. The actual weight of the subject was compared with the ICMR (2009), standard of weight for age.

Body Mass Index

Body Mass Index is a good indicator of body fat mass. BMI of the selected manual scavengers was calculated using the formula

Body Mass Index = Weight in kg / Height in m^2

To find out the prevalence of underweight and obesity, using the WHO, (2011) classification of BMI, the selected manual scavenger were classified as underweight (<18), Normal (18 – 23), overweight (23.1–27.5), obese grade I (27.5 –32.5), obese grade II (32.5–37.5), and obese III (>37.5).

Waist circumference

The selected manual scavengers wereasked to stand erect with the body weight evenly distributed. The subjects were asked to, stands with arms at the sides, feet positioned together, and weight evenly distributed across the feet. Using a non stretchable measuring tape the waist was measured at the midpoint between the lower margin of the least palpable rib and top of iliac creast.

Hip circumference

For both waist and hip measurements, the selected manual scavengers were asked to stand erect with feet close together, arms at the side and body weight evenly distributed, and were asked to wear lite clothing. Using a non stretchable measuring tape hip circumference was measured around the widest portion of the buttocks.

Waist - hip ratio

The Waist to Hip Ratio assess the prominent site of distribution of fat either on upper part or lower part of the body to determine the nature of obesity. The Waist to Hip Ratio was calculated for the entire subjects using the formula, Waist Hip ratio = waist (cm) /hip(cm).

Based on the WHO, (2011) classification of Waist to Hip Ratio the selected manual scavengers were classified as low risk (0.9 for men, 0.85 for women), moderate risk (0.9-0.95 for men, 0.85-0.9 for women), and high risk (>1.0 for men, >0.9 for women).

Clinical Assessment

Using Jelliffe's table of clinical assessment, the signs and symptoms for both micro and macro nutrient deficiencies for calories, protein, iron, calcium, and B complex vitamins were identified for all the two hundred selected manual scavengers.

The life style pattern

The lifestyle habit of smoking, alcohol and chewing beetle nut of the selected manual scavengers was collected. Frequency of smoking, drinking, and tobacco intake was also collected with the help of a well structured interview schedule.

Biochemical assessment

Biochemical test helps to diagnose deficiency diseases at the subclinical stage to confirm it as a diseased state (Bent, 2003).

The following biochemical analysis wascarried out to ascertain the extent of nutritional deficiency disorder.

Total haemoglobin content

A sub sample of 30 manual scavengers comprising 14 male and 16 females were randomly selected and their total haemoglobin content was assessed by withdrawing 2ml of venous blood, using cyanmethoaemoglobin method (Appendix II) to study the presence of anaemia. Using the ICMR standard for haemoglobin, (2009), the subjects were identified as mild, moderate and severely anaemic.

Random blood sugar

To ascertain the glycemic status of the selected manual scavengers, a test for random blood sugar, was performed for a sub sample of 30 manual

scavenger selected at random. From them 2ml of venous blood was taken and was analyzed for the random blood sugar level using GOD-PAP method. (GOD-PAP standard) (Appendix III).

Total lipid profile

The investigator as part of identifying the pre-disposing risk factors for obesity and cardiovascular diseases, analyzed the lipid profile of the manual scavenger. A total of 10 sub sample comprising five male and female each with the BMI more than 23 were randomly selected for the test.

The total lipid profile for cholesterol, triglyceride, LDL, HDL, and VLDL was measured using standard techniques. Five millelitter, of venous blood was collected from all the selected manual scavengers, and the cholesterol level was analyzed using HOD-PAP method. (HOD-PAP standard)(Appendix IV). The HDL, LDL, and VLDL levels were assessed using Enzyme Selective Protection Method. (Appendix VI and VII). The triglyceride levels were assessed using GPO-PAP method. (GPO-PAP standard) (Appendix V).

Blood Pressure

The blood pressure of all the two hundred subjects were checked using oscillometric blood pressure monitor.

Based on the WHO classification of blood pressure (2009), the selected subjects were classified as normal (130/85), mild hypertension, (140/90), moderate hypertension, (160/100), severe hypertension (>180/>110).

Dietary assessment

A dietary assessment is a comprehensive evaluation of a person's food intake. It is one the four parts of a nutritional assessment. A dietary assessment for the selected two hundred samples was assessed by conducting a 24-hour recall. Apart from this the food intake of the manual scavengers was assessed using a pretested food frequency table.

Twenty four hour recall method

Twenty four hour recall method is one the simple way to assess the nutritional status. The subjects were asked to recall the food item consumed by them for the last 24 hours. The cooked volume of the food consumed by the subject was converted into its raw equivalents. Using the nutritive value of Indian foods (NIN) the nutrient intake was calculated for all the two hundred subjects. The mean nutrient intake of the selected subjects was compared with the Recommended Dietary Allowance (RDA) of Indian foods. The difference between actual mean intake and RDA was statistically analysed.

Food frequency

A pre tested food frequency table was developed by the investigator to elicit information regarding the frequency and quantum of consumption of various food group, namely cereals, pulses, vegetables and fruits, milk and milk products and fleshy foods.

IV RESULTS AND DISCUSSION

The result of the study entitled **"Nutritional challenges of manual scavengers of selected blocks of Coimbatore"** is discussed under the following headings:

A. Background information

B. Family details

C. The socioeconomic status

D. Anthropometric measurements

E. Clinical assessment

F. Biochemical assessment

G. Life style habits

H. Dietary information

A .Background Information

The background information for age, sex, education, occupational and income status of the selected manual scavengers was elicited using an interview schedule and the data collected were discussed in the following table.

Age wise distribution

Age wise distribution of the selected manual scavengers is depicted in Table I.

Table I

Age Wise Distribution of Selected Manual Scavengers

Age group	Male (N=95)	Female (N=105)
20-39	9	Nil
30-39	27	24
40-49	38	40
50-59	21	41
Total	95	105

The Table I, clearly indicates that maximum number of manual scavengers (35) were in the age group of 40-49 years and maximum female manual scavengers (41) belonged to the age group of 50-59 years. Followed bythis 40 female manual scavengers were in the age group to 40-49 years. Only nine out of 95 males belonged to the age group of 20-29 years.

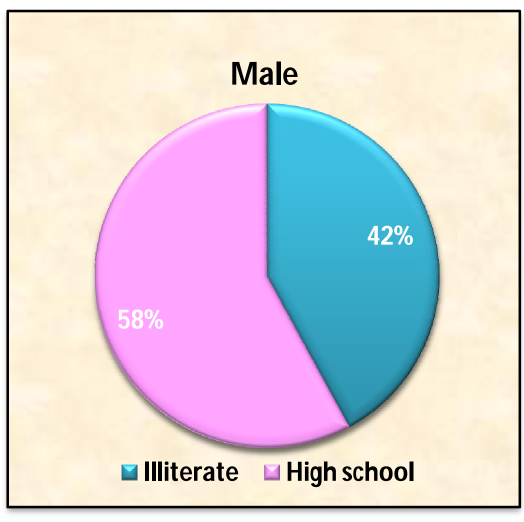
Educational Status

The educational status of the selected manual scavengers is given in Table II and Figure 1.

Table II

Educational Status of the Selected Manual Scavengers

Educational Status	Male (N=95)	Female (N=105)	Total (N=200)
Illiterate	40	72	112
High school	55	33	88



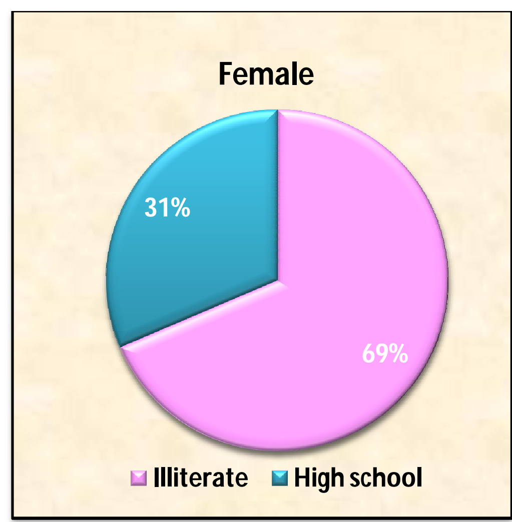


Figure 2

Education status of the selected manual scavengers

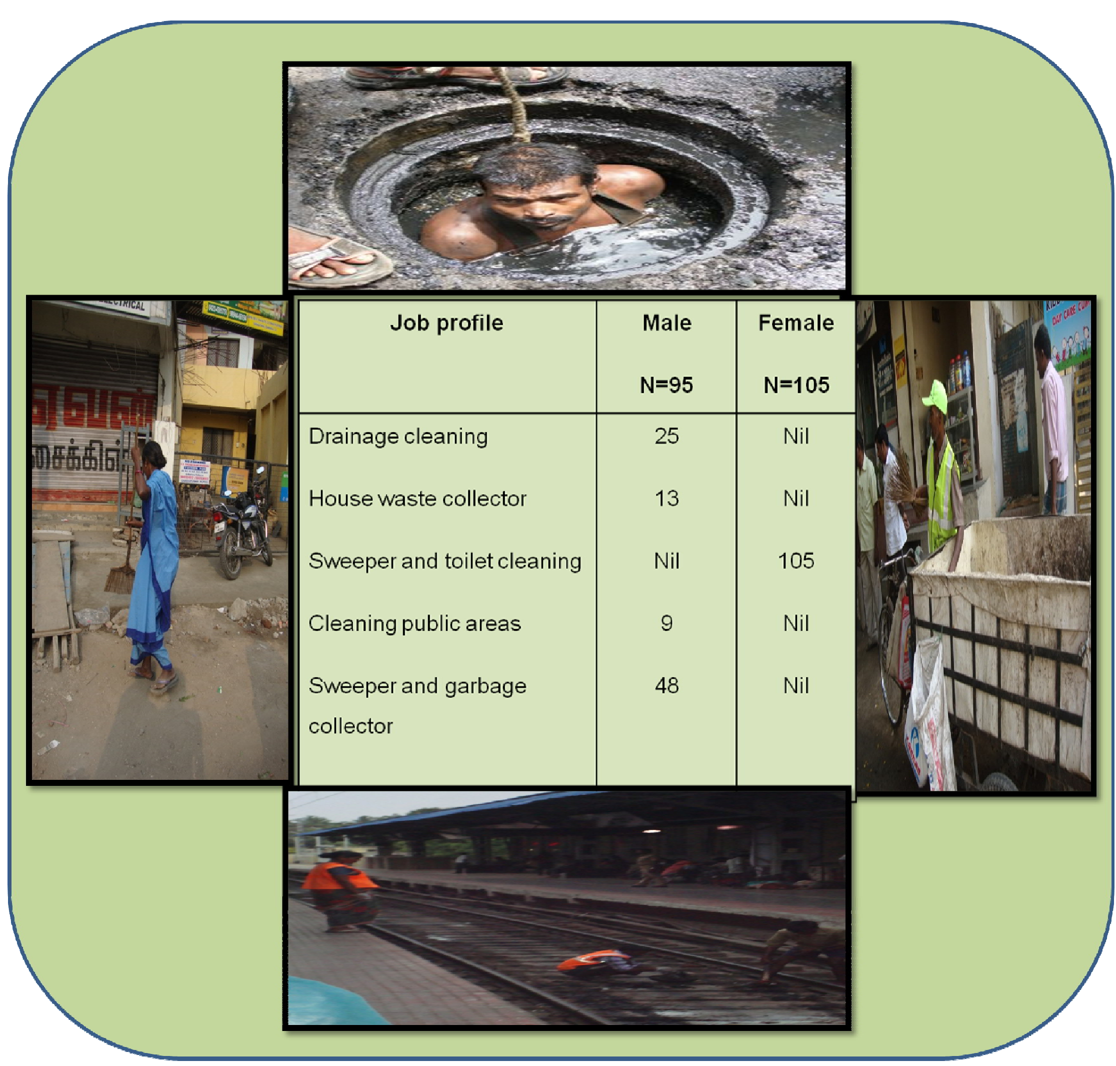
It was alarming to note that out of 105 female and 95 male manual scavengers, 72 females and 40 males were found to be illiterate. The rate of illiteracy was high among females compared to males. It was also observed that 55 out of 95 male manual scavengers have completed only their high school level of education and have not done their higher education. Thus the abovefinding reveals a poor status of education of these underprivileged group.

In spite of numerous educational policies the right for education still remains as a dream.

Education of manual scavengers refers to the creation of an institutional mechanism that can fosters an environment in which their self-esteem can flourish and their creativity can blossom. Education will teach them the values of self respect, equality and freedom to lead a respectable life in the society. It will expose them to problem of social exclusion, poverty and individual disparities and will enable them to lead a quality of living (Sachithanandam, 2009).

Occupational status

Information pertaining to the occupational status-the job profile in particular and the duration of the working hours wascollected through the interview schedule and the observation is projected in the Figure 2.



Job profile	Male N=95	Female N=105
Drainage cleaning	25	Nil
House waste collector	13	Nil
Sweeper and toilet cleaning	Nil	105
Cleaning public areas	9	Nil
Sweeper and garbage collector	48	Nil

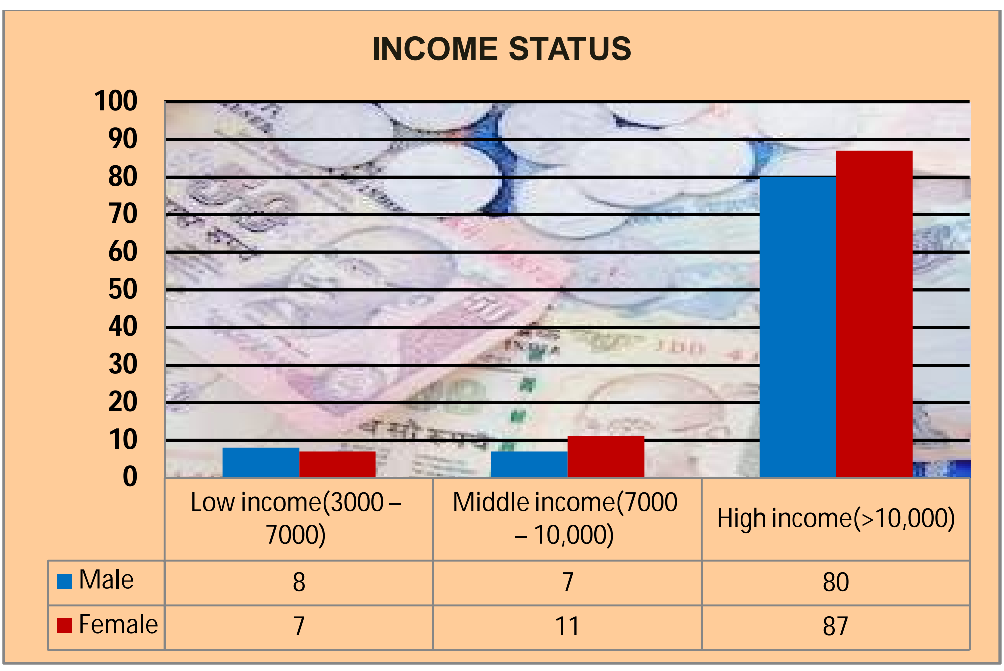
Figure 3

The Job Profile of the Selected Manual Scavengers

Out of 95 male manual scavengers, 47 of them were involved in sweeping and garbage collection. Twenty five of the male manual scavengers did drainage cleaning and 13 of them collected housewaste. In contrast all the 105 female scavengers did sweeping and cleaning of public toilets. Further it was also noted that irrespective of sex all the manual scavengers worked for eight hours a day.

Income status

Using a well structured interview scheduletheincome status of the manual scavengers was elicited and the observation on their income levels and wage details illustrated below:



Dept	Male – Rs.6115	Female – Rs.5638

HUDCO classification – 2010,

Figure 4

Income Status of the Selected Manual Scavengers

The Government of India report (2003) adjudge that manual scavengers are still in the below poverty-line of economic status and low income occupations. It also states that the efforts made towards their socioeconomic development were far from the required critical level and therefore the base remained almost stagnant.

The finding of the current study (fig. 3) Based on HUDCO classification (2010), reveals that 167 out of two hundred manual scavengers earned more than Rs.10,000 per month and 15 of them (male-8, female-7) belonged to a low income group with a monthly earning Rs.3000 and 7000 per month. Though

the income of the manual scavengers were in the range of Rs.10,000-15,000, on an average every male and female manual scavenger had a monthly dept of Rs.6115/- andRs. 5638/- respectively.

Manipudna Jena, (2006),in his study claim that the habit of getting loan is so rampant in the sweepers colonies that most of the families are deep in debt from loan sharks, who charge 10 per cent per month or 120 per cent annual interest.

B. Family Details

Using a structured interview schedule the family details of the manual scavengers for type of family, family size, educational and occupational status of the children were elicited and is presented in the following table.

Type of family

Table III projects the type of family of the selected manual scavengers.

Table III

The type of family of the selected manual scavengers

Type of family	Male (N=95)	Female (N=105)	Total (N=200)
Nuclear	76	72	148
Joint	19	33	52

Out of 200 manual scavengers 148 of them (male – 76, female 72) lived in nuclear family.

Family size

The family size of the selected manual scavengers is depicted in Figure 4.

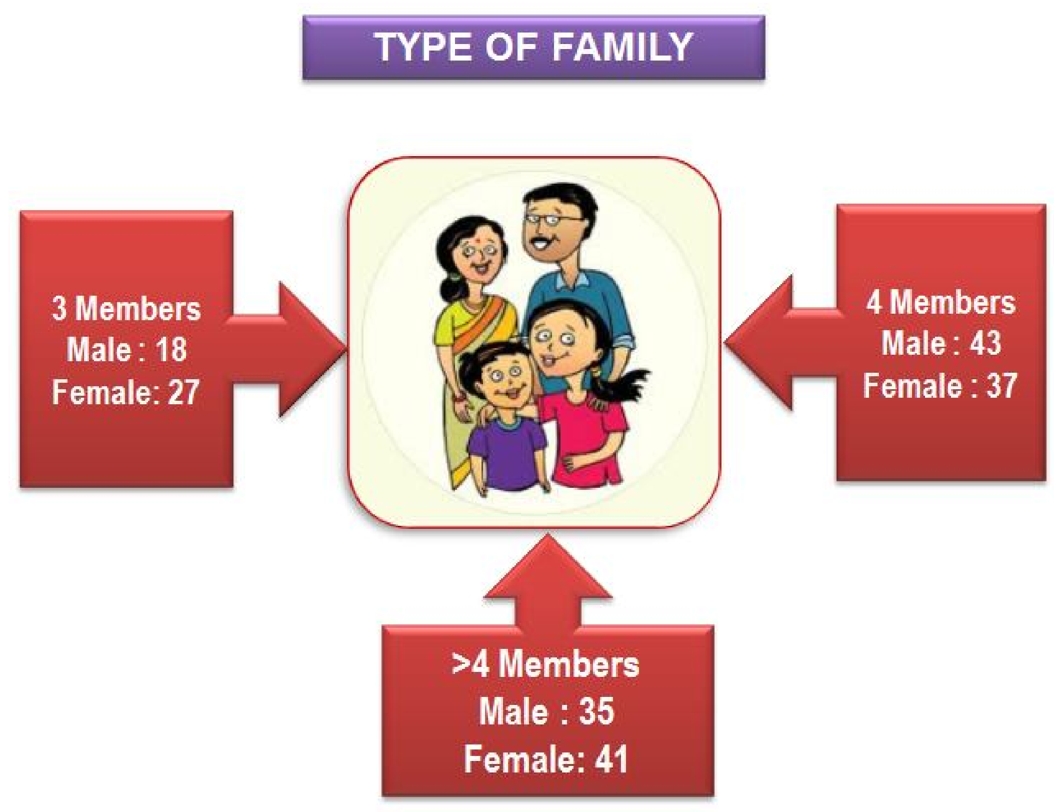


Figure 5

Family Size

From the above figure 4, it is clear that 35 out of 95 male manual scavengers and 41 out of 105 female, manual scavengers lived in large family with more than four members. Likewise 45 manual scavengers (male-18, females-27) lived in small family with three or less than three members.

Status of the children

Table IV shows the children's educational status of the selected manual scavengers.

Table IV

Children's Educational Status of the Selected Manual Scavengers

Status of children	Male (N=95)		Female (N=105)	
Schooling	57		12	
Type of school	Govt 47	Pvt 10	Govt 30	Pvt 3
Number of dropout	10		16	
Status of the dropout children	Simply at home 6	Child labor 4	Simply at home 11	Child labor 5
Reasons for dropouts	Lack of motivation and discrimination 10	Poverty Nil	Lack of motivation and discrimination 16	Poverty Nil

The table IV, projects that children of47 out 95 male scavengers and 36 out of 105 female manual scavengers did their schooling in Government aided schools. Twenty six children of the selected manual scavengers were found to be school dropout out of whichnine of them (male 4, female 5) worked as child labor. The manual scavengers expressed lack of motivation and discrimination as strong reason for school dropout.

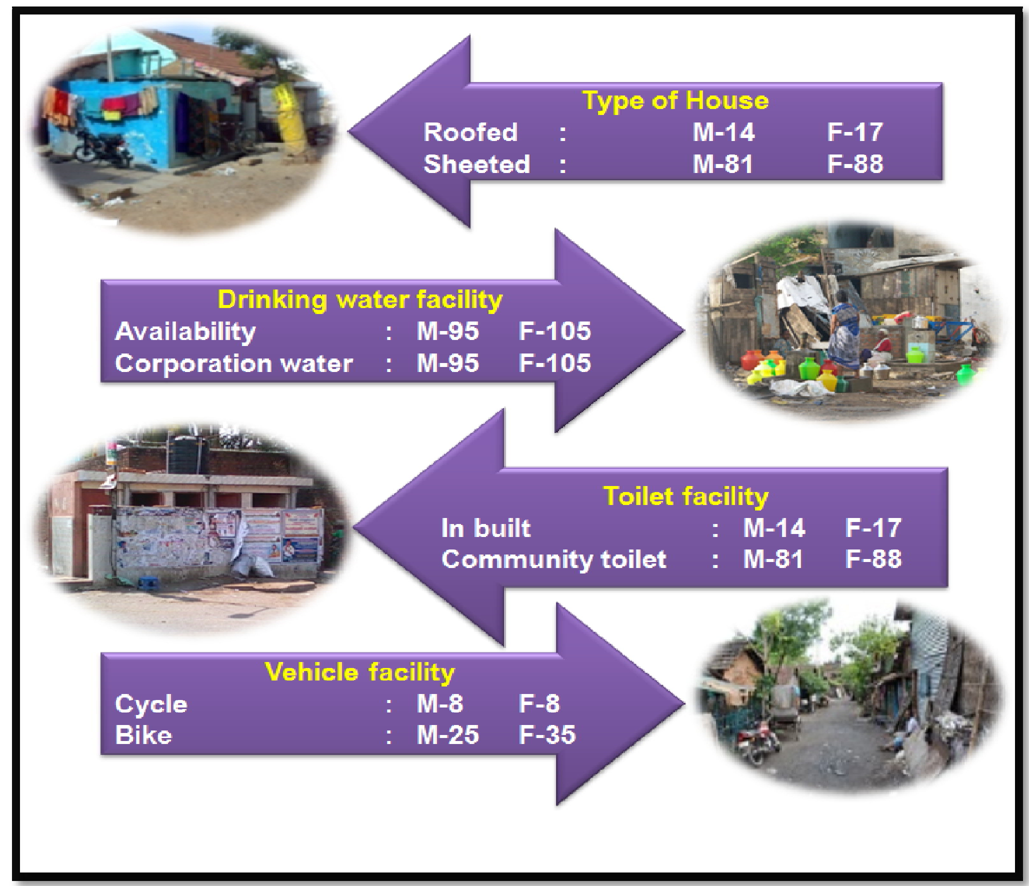
An enormous stress is created in the minds of tender, impressionable children through a rejection of their needs and constant reinforcement of the

idea that they are not equal to their fellow studies. As per the words of children of manual scavengers are not only disadvantaged by poverty, but also by social exclusion from civil and political processes and other forms of social interaction therefore it is very important to address.

C. The socio-economic status

To get an insight into their quality of living, using apre-tested interview schedule the socio economic details pertaining to place of dwelling, housing facilities, provision for safe drinking water and toilet facility were also studied.

The observation on the socio economic status of the selected manual scavengers is sketched in figure 5.



M-MALE F-FEMALE

Figure 6

Socio-economic Status of the Selected Manual Scavengers

The figure 5, shows thatout of 200 manual scavengers, 169 of them lived in sheeted house. It was also observed that none of them lived neither in thatched house nor in hut. All the manual scavengers had access to drinking water once a week from the corporation common water tap. It was

disheartening to note that except 31 manual scavengers, the rest of the manual scavengers (male-81, female-88) used community toilets for defecation. Also 25 males and 35 females had owned two wheelers.

D. Anthropometric measurement

The anthropometric measurement for height, weight, BMI and Waist Hip Ratio of the selected manual scavengers was measured using standard equipment and the data collected were projected in the following table.

Height

The height of the all the selected manual scavengers was measured using a oscillometric blood pressure monitor and their mean height is shown in Table V and Figure 6.

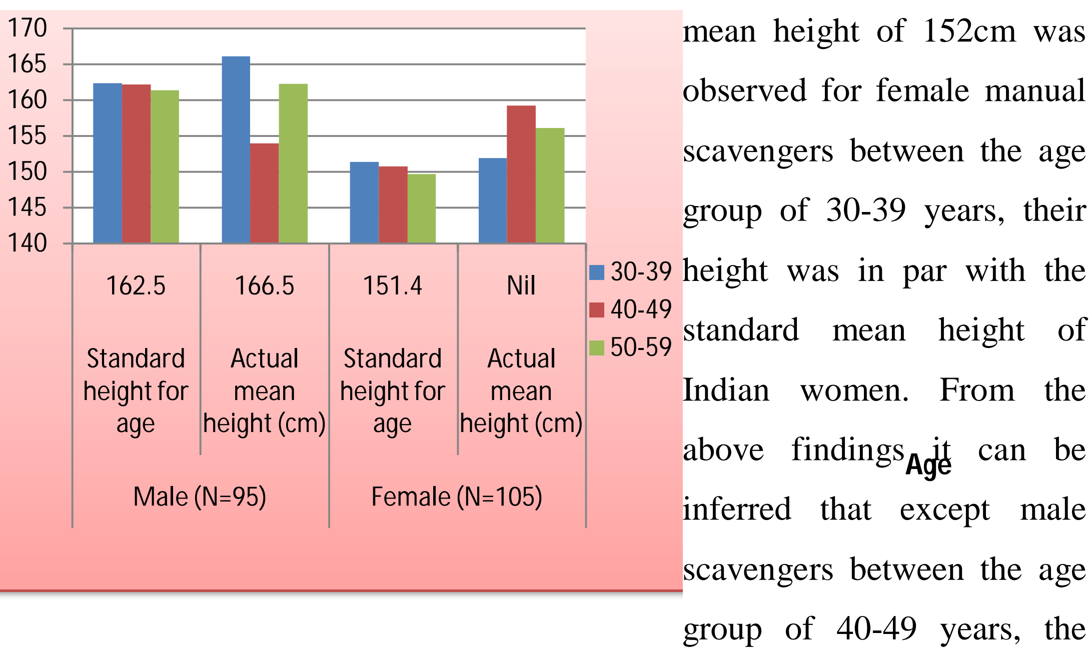
TABLE V

The mean Height of the Selected Manual Scavengers

Age	Male (N=95)		Female (N=105)	
	Standard height for age	Actual mean height (cm)	Standard height for age	Actual mean height (cm)
20-29	162.5	166.5	151.4	Nil
30-39	162.4	166.2	151.4	152
40-49	162.2	154	150.8	159.3
50-59	161.4	162.3	149.7	156.2

***ICMR- standard height for age (2009)**

From the tableV and Figure 6, the same age group. Similarly though the lowest



mean height of 152cm was observed for female manual scavengers between the age group of 30-39 years, their height was in par with the standard mean height of Indian women. From the above findings, it can be inferred that except male scavengers between the age group of 40-49 years, the rest of them had

Figure 7

Mean Height of the Selected Manual Scavenger

normal height for their age, indicating a good growth rate.

Weight

The weight of the all the selected manual scavengers was measured usinga electronic weighing scale and their mean weight is projected in Table VI and Figure 7

Table VI

The mean weight of the selected subjects

Age	Male (N=95)		Female (N=105)	
	Standard weight for age	Actual mean weight (kg)	Standard weight for age	Actual mean weight (kg)
20-29	51.5	60	44.8	Nil
30-39	52.3	63	45.9	60
40-49	52.2	70	45.8	60
50-59	50.6	63	58	44.1

***ICMR–standard weight for age (2009)**

The table VI and Figure 8, indicate that the mean weight of the manual scavengers irrespective of their sex reported an increase in their weight gain compared to the ICMR standard weight for age (2009). In contrast to the mean height of themanual scavengers a maximum gain in mean weight of 70 kg for the male scavengers of 40-49 years

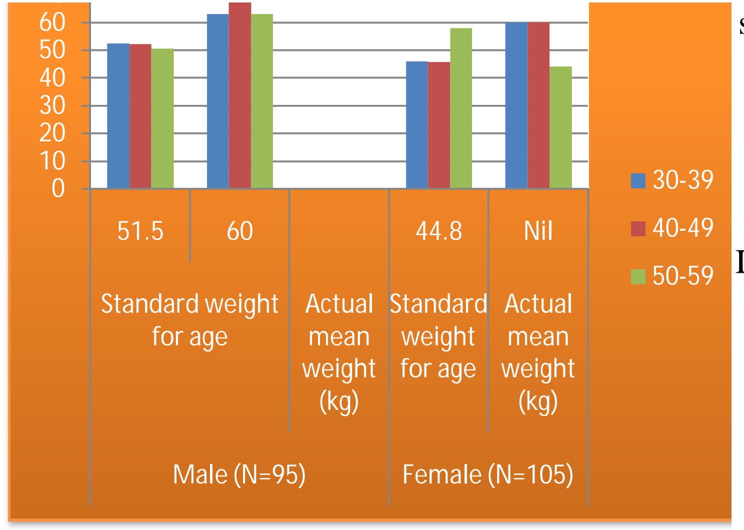


Figure 8

Mean Weight of the Selected Manual Scavengers

and 60 kg for females of 30-39 years was observed. Hence it can be inferred that male and female scavengers of the above age group of 40-49 years and 30-

39 years had poor height for weight indicating the possibilities of the subject either being overweight or obese.

Body Mass Index

The Body Mass Index of the selected manual scavengers is presented in Table VII and Figure 8

Table VII

Body Mass Index of the Selected Manual Scavengers

Age	Male (N=95)	Female (N=105)	Total (N=200)
Under weight	5	5	10
Normal	44	24	68
Overweight	34	51	85
Obese grade I	12	20	32
Grade II	Nil	3	3
Grade II	Nil	2	2

❖ **BMI classification, (WHO, 2012)**

The Table VII and Figure 9, indicates that, 85 out of 200 manual scavenger were found to be overweight. Also 32 manual scavengers (male -12, female -20) were found to be grade I obese with the BMI between the range of 27.5-32.5 and ten manual scavengers (male 5, female 5) were found to be underweight with their BMI the less than 18. It was also observed that 68 subjects (male 44, female 24)were found have a normal BMI of 18-23.

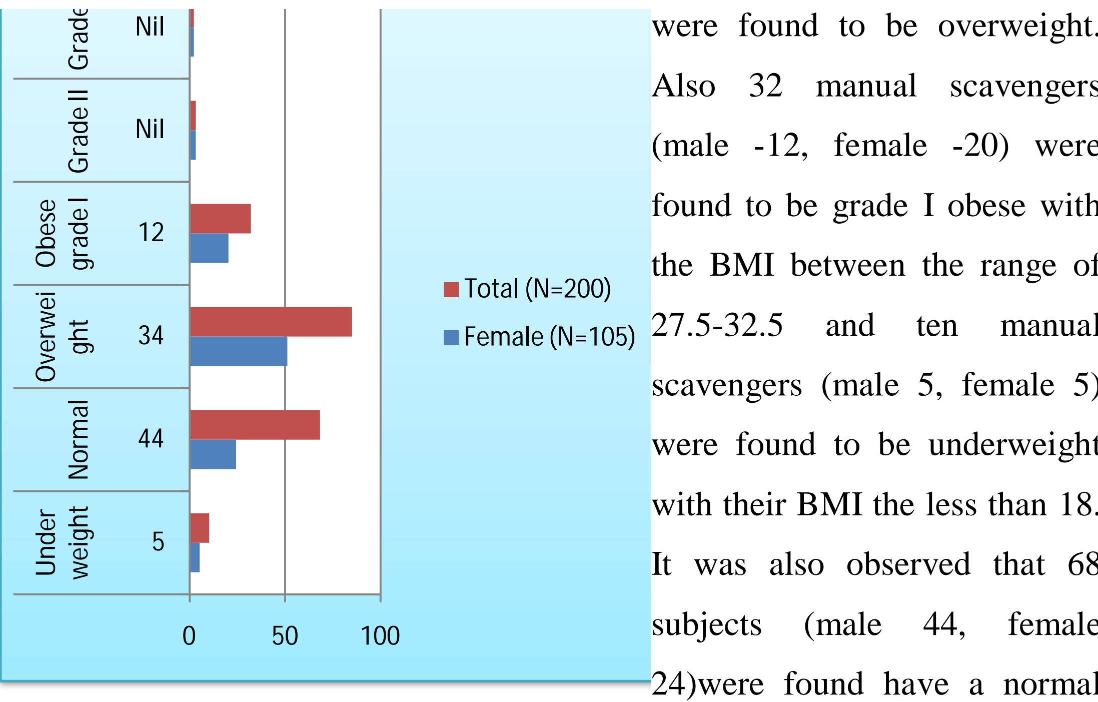


Figure 9

Body Mass Index of the selected manual scavengers

Waist Hip Ratio

The Waist to Hip Ratio of the selected manual scavengers was calculated using waist and hip circumference and the findings are tabulated in table VIII.

The waist hip ratio of the selected subjects is projected in the Table VIII

Table VIII

Waist Hip Ratio of the Selected Manual Scavenger

Risk	Waist Hip Ratio			
	Risk Index Male	WHR Male (N=95)	Risk Index Female	WHR Female (N=105)
Low risk	0.9	20	0.85	60
Moderate risk	0.9-0.95	75	0.85-0.9	44
High risk	>0.1	Nil	>0.9	Nil

WHO, standard value for Waist Hip Ratio (2011)

The Table VIII, shows that 75 out of 95 male scavengers and 44 out of 105 female scavengers were at moderate risk for obesity. Further none of the manual scavengers were found to be in the high risk for obesity

E. Clinical assessment

Using Jelliffe's table of clinical assessment the signs and symptoms of deficiency disorders for both micro and macro nutrient was observed for all the selected manual scavengers and the findings are tabulated in Table IX.

Table IX

Clinical Signs and Symptoms Exhibited by the Selected Manual Scavengers

Micro and macro nutrients	Signs and symptoms	Male (N=95)	Female (N=105)
Iron	pale conjunctiva	37	56
Vitamin A	Dry, grayish cornea	29	23
Riboflavin	Magenta tongue	14	47
Vitamin C	Spongy gums, painful joints	12	15
Calories	Excess fat stores	5	6
Excess sugar	Caries, poor teeth	38	49
Zinc	Lack of shine and luster	29	62

The table IX, indicates that 56 out of 105 female manual scavengers exhibited symptom for iron and vitamin B12 deficiency. Forty nine female scavengers had dental carries which can be attributed to their habit of chewing tobacco and beetle nuts. In spite of having a normal hemoglobin level (sub sample table X) 37 male manual scavengers had pale conjunctivitis a common symptom for iron deficiency. Magenta tongue a classical symptom of B-complex deficiency was reported in 14 males and 47 females.

F. Life style habits

Using a structured interview schedule the life style behavior of the manual scavengers for habit of smoking, alcohol consumption, and tobacco chewing were elicited. The frequency and duration of smoking and alcohol consumption was also observed

Smoking

The habit of smoking, frequency of smoking and type of smoking of the selected manual scavengers is presented in the table XIV.

Smoking	Male (N=95)
Habit of smoking	33
Frequency of smoking	
2 hour once	1
4 hr once	14
6 hour once	15
Daily once	3
Quantum of smoking	
12 per day	1
6 per day	14
4 per day	15
1 per day	3
Duration of smoking	
More than 5 year	24
More than 10 year	9

The Figure 10, shows that among 95 selected male manual scavengers, 33men had the habit of smoking. Of the 33 members 14 member smoked six cigarette in a day at an interval of four hours. It was also noted that 24 out of 33

manual scavengers, were smoking for more than five years a potient risk factors for cardiovascular disease, cancer and diabetes.

Alcohol consumption

The frequency and the quantum of consumption of alcohol by the selected manual scavengers is depicted in Figure 11.

It of alcohol

TYPE OF ALCOHOL
Brandy
Male: 46 Female: 5

Frequency of Consume

	Male	Female
Daily	10	0
Weekly thrice	14	0
Weekly twice	10	2
Weekly once	3	3

Quantum of consume alcohol

	Male	Female
Quarter (250ml)	28	3
Half (50ml)	18	2

Figure 9

Habit of alcohol consumption

The Figure 11, indicates that 46out of 95 male scavengers and five out of 105 female manual scavengers were found to be alcoholic. All the 46 scavengers drank brandy. Nineteen out 46 male scavengers consumed brandy daily. It was also observed that nearly 18 male scavengers consumed 500ml of alcohol everyday.

Chewing beetlenut

Information elicited on the habit of chewing tobacco and beetlenut is projected in Table XV.

Table XX

The status of tobacco chewing of the selected manual scavengers

Tobacco chewing	Male (N=95)	Female (N=105)
Habit of tobacco chewing	26	83
Type of tobacco		
Beetlenut	3	11
Beetle nut with tobacco	11	72
Pan	12	Nil
Frequency of chewing		
2 hr once	1	20
4 hr once	21	54
6 hr once	4	8
Daily once	Nil	1

From the table XX, it was shocking to know that 83 out of 105 female manual scavengers were found to be chewing tobacco. Ninety two of women had the habit of chewing beetle nut with tobacco one of the potential risk for oral cancer.Like wise 26 men chewed tobacco of which 21 subjects chewed it once in every four hours.

WHO estimated that 91 per cent of oral cancers in South-East Asia are directly attributed to the use of tobacco and this is leading cause of oral cavity and lung cancer in India.

G. Biochemical parameter

The biochemical parameter for hemoglobin, random blood sugar, blood pressure and lipid profile for the selected subsamples (n=30) of manual scavengers was assessed using standard procedures and the findings are projected in the following table.

Hemoglobin level

Hemoglobin level of selected manual scavengers is flashed in the Table XI

Table XI

Hemoglobin Level of the Selected Manual Scavengers

Hemoglobin level (n=30)	Male (n=14)	Female (n=16)	r value
Normal (M–14, F–12 mm/Hg)	14	13	M = -247 F = 527
Mild (M–12.9-13, F–11-11.9 mm/hg)	Nil	1	
Moderate (M–10-12, F–8-10mm/Hg)	Nil	2	
Severe (M-<10, F-<8mm/Hg)	Nil	Nil	

ICMR, standard value for hemoglobin (2009) **M – male, F- Female**

The table XI, clearly indicators that out of 30 randomly selected subsample, the total hemoglobin content was found to be normal for 14 and 13 male and female manual scavengers respectively. None of the male manual scavengers were found to be anemic. Also it was observed that three (mild anemic 1, moderate 2), out of 16 female manual scavengers were found to be anemic. The normal hemoglobin level of male manual scavengers can be attributed to their high intake of non-vegetarian food in general. Correlation analysis between mean dietary iron intake and total hemoglobin were found to be non-significant.

Random blood sugar level

The random blood sugar level of the selected manual scavengers is presented in Table XII

Table XII

Random blood sugar level of the selected manual scavengers

Random blood sugar (mg/dl)	Male (n=14)	Female (n=16)	Total (n=30)
Low (<70)	2	Nil	2
Normal (80-110)	5	8	13
Moderate (120-160)	5	6	11
High (>180)	2	2	4

The Table XII, clearly indicates that, among the selected 30 sub-samples, random blood sugar level was normal for 13 manual scavengers (male 5, female 8) who's random blood sugar level were within the range of 80-110mg/dl. Out of 30 subjects four manual scavengers (male 2, female 2) were found to be hyperglycemic and have the potential risk of being diabetic infuture.

Blood pressure level

The selected manual scavengers were monitored for their blood pressure using a oscillometric blood pressure monitor and the corresponding results were tabulated in the table preceding XIII.

Table XIII

The blood pressure level of the selected manual scavengers

Blood pressure (mm/Hg)	Male (N=95)	Female (N=105)	r value
Normal (130/85)	25	22	
Mild hypertensive (140/90)	29	33	M - SBP=1.0
Moderate hypertensive (160/100)	14	17	DBP=1.0 F – SBP=1.0 DBP=1.0
Severe hypertensive (<180/>110)	13	9	

WHO, standard value for blood pressure (2009)M – Male, F – Female. SBP-Systolic blood pressure, DBP – Diastolic blood pressure

From the table XIII, it is evident that 29 out of 95 male manual scavengers 33 out of 105 female were found to be mild hypertensive. Followed by this 14 male and 17 female manual scavengers were reported to have moderate hypertension. Also it was alarming to note that 13 male and nine female manual scavengers were found to be severely hypertensive with their blood pressure ranging between>180/>110.No significant correlation between weight and blood pressure were observed.

Lipid profile

Lipid value of the selected manual scavengers is depicted in table XIII.

Table XIV

Lipid profile of the selected manual scavengers

Lipids	Male (n=5)	Female (n=5)	r value
Total cholesterol Normal (200-239 mg/dl) High (>239 mg/dl)	5 -	4 1	M = -0.13 F = 0.5
HDL Normal (<40 mg/dl) High (>60 mg/dl)	3 2	3 2	M = -0.01 F = 0.6
LDL Normal (<150 mg/dl) High (160-169 mg/dl)	4 1	4 1	M = 0.006 F = -0.01
Triglycerides Normal (<150 mg/dl) High (200-249 mg/dl)	2 3	2 3	M = 0.63 F = 1.00

ICMR, standard value for lipid profile (2011) M-Male, F-Female

Lipid profile of the 10 manual scavengers selected at random (Table XIV) indicates that except for one female, the cholesterol level was normal for the rest of the subjects. Also it was noted that seven manual scavengers (male 3, female 4) had normal HDL level. Elevated level of triglyceride between the range 200-249mg/dl was observed for six manual scavengers comprising three male and female each.There is no correlation of weight with cholesterol, LDL, and HDL. But there is a significant correlation between weight gain and triglyceride.

H. Dietary information

Using an interview schedule the dietary habits of the manual scavengers for, meal pattern, dietary habits and skipping of meals were elicited.

Meal pattern

The dietary information on meal pattern, of the selected manual scavenger is projected in the following table XV

Table XV

Meal Pattern of the Selected Manual Scavengers

Meal pattern	Male (N=95)	Female (N=105)
2 meal per day	73	98
3 meal per day	22	7

The meal pattern of the 200 manual scavenger depicted in above table; indicates that 98 females and 73 males owing to lack of time to eat, consumed only 2 meal in a day and the rest of them (22 males and 7 females) consume d three meal per day.

Skipping of meals

The skipping of meals of the selected manual scavengers is depicted in the table XVI.

Table XVI

Skipping of Meals of the Selected Manual Scavengers

Skipping of meals	Male (N=73)	Female (N=98)
Breakfast	73	98
Frequency of skipping meals		
Daily	41	74
Weekly once	3	1
Weekly twice	5	9
Occasionally	24	14

Dietary survey revealed that 41 males and 74 females skipped their meals daily. Twenty four males and 14 females skipped it occasionally. Only five male and nine female skipped their meals twice a week.

Total food and other expenditure

The mean monthly expenditure of the selected manual scavengers is presented in the table XVII..

Table XVII

Mean Monthly Expenditure of the Selected Manual Scavengers

Total expenditure In	Male(N=95) (Rs.)	Female(N=105) (Rs.)
Food expenditure		
Rice	1106	1534
Pulses	276	257
Oil	188	190
Vegetables	459	337
Milk/tea	555	510
Non-veg	1105	1128
Spices	119	131
Snacks	522	570
Total	4330	4657
Other expenditure		
Medical	390	366
Tobacco/cigarette	300	330
Alcohol	1920	640
Transportation	540	460
Dept	6115	5638
Total	9265	7434

The mean monthly food expenditure of male manual scavengers was found to be Rs 4,330. Whereas female spent Rs 4657 towards their food expenditure. It was also noted that men spent 1/5th of their earning (Rs 1920) towards consumption of alcohol. As part of spending their income towards

repayment of dept, male and female manual scavengers shell out Rs.6115 and Rs.5638 every month.

Food frequency

The food frequency of the selected manual scavengers is given in (appendix VIII) and the discussion is as follows.

Cereals

Rice was the staple food for all the selected manual scavengers. Wheat was consumed by 68 male and 76 female on weekly basis. Semolina and vermicelli were consumed by all the selected manual scavengers on once a week. Cereals like ragi, maize, jowar, kambu and cholam which are rich source of fibrewere not consumed by the manual scavengers.

Pulses

Redgram dhal was consumed by 25 male and 37 female twice a week in the form of sambar and kootu, whereas 14 male and 17 female consumed it thrice a week. Irrespective of all manual scavengers cowpea and horse gram was consumed once a week. Greengram dhal a known protein and B vitamin rich pulse was consumed only once in a month in the form of pongal and payasam. Bengal gram dhal, rajmah, soybean which are rich source of protein, B vitamin and fibre were not consumed by anyone.

Green leafy vegetables

Green leafy vegetables like manathakali and paruppukeerai a rich source of fibre, vitamins and minerals was consumed by all the selected manual scavengers only once a week. Araikeerai and cabbage were consumed occasionally. Drumstick leaves a cheap source of iron and vitamin A was also consumed once in a month.

Other vegetables

Other vegetables like brinjal, broad beans, drumstick, bottle gourd or snake gourd a rich source of dietary fibre and vitamin C were consumed once

a week. Owing to escalating cost of vegetables like beans and ladies finger vegetables once consumed by them regularly were now consumed occasionally depending on the cost of the vegetables.

Nuts and oilseeds

Like pulses, nuts and oilseeds are rich source of protein, B vitamins, vitamin E and also fat. Coconut was consumed by 61 male and 83 female on weekly basis. Twenty two male and 16 female on monthly basis. Groundnut arich source of thiamine and nicotinic acid was consumed by 25 males and 36 females once a week and 61 male and 62 female once a month. Other nuts and oilseeds like cashew, badam and gingelly seeds are rich source of vitamin E, fat and energy were not at all consumed by all the selected manual scavengers because of their high price.

Condiments and spices

Since spices and condiments are part of day to day cooking they are included in the meals daily.

Milk and milk products

Milk is a good source of protein, calcium, thiamine and riboflavin. Milk was consumed by all the selected manual scavengers daily. Seven male and 12 female took curd daily. Consumption of curd by female was food to be poor and 28 female took curd occasionally. Other milk products like butter, ghee and milk powder were not at all purchased.

Sea foods

In sea foods fish is the predominant item by all the selected manual scavengers. Fish a rich source of quality protein and B vitamins. Other sea foods like prawn and crab were not purchased because of their high price.

Meat products

The selected manual scavengers took fleshy foods once a week. Since beef is cheaper compared to other fleshy food it was preferred more than mutton and chicken. Twenty two males and 24 female manual scavengers took egg once a week.

Fats and oils

Fats and oils are rich source of energy, beta carotene and vitamin E. Palm oil one of the cheapest and easily available oil in PDS was consumed by 88 male and 64 female on a daily basis and rest of them used refined oil for their cooking. Consumption of reused oil was also found to be high among this group.

Mean nutrient intake

A 24 hour recall was done for all the selected manual scavengers and their mean nutrient intake discussed in the following table.

The mean nutrient intake of the selected manual scavengers is projected in table XVIII.

Table XVIII

Mean Nutrient Intake of Selected Manual Scavengers

Nutrients	Men (N=105)		T value	Women (N=105)		T value
	Mean	RDA		Mean	RDA	
Energy	2455.74	2875	26.45**	2767.31	2225	18.27**
Carbohydrates	247.62	320	16.23**	274.15	270	0.86[ns]
Protein	86.40	60	7.35**	82.91	50	11.47**
Fat	82.78	20	12.67**	81.98	20	16.31**
Calcium	692.22	400	21.68**	646.22	400	19.25**
Iron	11.28	28	5.82**	11.66	30	6.17**
Vitamin A	479.31	3000	78.12	593.83	3000	89.35**
Thiamin	0.71	1.4	1.98*	0.47	1.1	1.89*
Riboflavin	0.45	1.6	2.89**	0.40	1.3	2.57*
Niacin	8.95	18	4.98**	8.87	14	3.63**
Vitamin C	26.21	40	9.33**	26.19	40	7.94**
Folic acid	191.14	100	12.67**	196.25	100	25.45**

* Significant at 5% level ** - Significant at 1% level ns – Not significant

The actual mean nutrient intake of the male manual scavengers showed a deficit intake for calcium, carbohydrate, iron, vitamin A, thiamin, riboflavin, niacin, vitamin C and folic acid significant at one per cent level of significant.

Similarly the female manual scavengers showed a deficit intake for like iron, thiamin, riboflavin, niacin, vitamin C, and folic acid significant at five percent level of significance. Unlike male it was also observed that the female showed an excess intake, of calcium, carbohydrate, protein, and fat compared to the Recommended Dietary Allowances. Significant at one per cent level of

significance. The deficit intake of nutrient can be attributed to poor food intake, unhealthy food choices and less food expenditure observed during the study.

V. SUMMARY AND CONCLUSION

Manual scavenging is a practice by which underprivileged remove excreta from public and private dry pit latrines and carry them to dumping grounds and disposal sites. However there is no doubt, that manual scavenging is still present in many parts of India. An estimated 1.3 million people are still engaged in the occupation with great risk for health and well being.

Through the NGO's and other welfare organization has studied the social issues pertaining to them, the nutrition and health status is not yet explored to a large extent. Hence the study was carried out with the objective to study the background information, socio economic condition and to assess the nutritional and health status of the selected manual scavengers.

The investigator selected to study the nutritional challenges of manual scavengers in selected blocks of Coimbatore. Two hundred manual scavengers comprising 95 male and 105 female were selected purposively from 18 out of 100 wards (random sampling). With the help of a structured interview schedule the background information, family details, the socio economic status and lifestyle pattern of the manual scavengers were elicited.

The nutrition challenges of the selected manual scavengers were ascertain by assessing the nutritional status. The anthropometric assessment for height, weight, waist circumference and hip circumference was made using standard tools. The BMI and WHR were calculated and were compared with the WHO standard. The clinical assessment was done for micro and macro nutrient deficiencies using Jelliffe's table of clinical assessment.

As part of the biochemical analysis a subsample of 30 manual scavengers were randomly selected and were tested for total hemoglobin using Cyanmethaemoglobin method. The random blood glucose level was analyzed by GOD-PAP method. The total lipid profile for cholesterol, triglyceride, LDL, HDL, and VLDL was measured using standard techniques. The cholesterol level was analyzed using HOD-PAP method. The HDL, LDL, and VLDL

levels were assessed using Enzyme Selective Protection Method and triglyceride level was assessed using GPO-PAP method. The blood pressure was monitored for all the 200 manual scavengers using oscillometric blood pressure monitor.

The lifestyle behavior for smoking and alcoholism were also elicited. The dietary habits, meal pattern, skipping of meals and food expenditure was elicited using interview schedule. The food consumption was assessed by administrating a pre-tested food frequency table. The actual mean nutrient intake of the manual scavenges for nutritional adequacy was tested by doing a 24 hour recall. The subjects were asked to recall the food item consumed by them for the last 24 hours. The cooked volume of the food consumed by the subject was converted into its raw equivalents. Using the nutritive value of Indian foods (NIN) the nutrient intake was calculated for all the two hundred subjects. The mean nutrient intake of the selected subjects was compared with the Recommended Dietary Allowance of Indian foods. The data obtained were statistically analyzed using t-test and Pearson correlation analysis.

The summarized finding of the study is as follows

- Maximum number of manual scavengers (35) were in the age group of 40-49 years and maximum female manual scavengers (41) belonged to the age group of 50-59 years.
- Out of 105 female and 95 male manual scavengers 72 female and 40 male were found to be illiterate. The rate of illiteracy was high among females compared to males. It was also observed that 55 out of 95 male manual scavengers have completed their high school level of education.
- Out of 95 male manual scavengers, 47 of them were involved in sweeping and garbage collection. Twenty five of them did drainage cleaning and 13 of them collected house waste. In contrast all the 105 female scavengers did sweeping and cleaning of public toilets.

- Further it was also noted that irrespective of sex all the manual scavengers worked for eight hours a day.
- One hundred and sixty seven out of 200manual scavengers earned more than Rs.10,000 per month and 15 of them (male-8, female-7) belonged to a low income group with a monthly earning Rs. 3000 and 7000 per month. As part of spending their dept male and female manual scavengers shell out Rs 6115 and Rs 5638 every month.
- Manipudna Jena, (2006), in his study claim that the habit of getting loan is so rampant in the sweepers colonies that most of the families are deep in debt from loan sharks, who charge 10 per cent per month or 120 per cent annual interest.
- Out of 200 manual scavengers 148 of them (male – 76, female 72) lived in nuclear family.
- Thirty five out of 95 male manual scavengers and 41 out of 105 female, manual scavengers lived in large family with more than four members.
- Forty seven out 95 male scavengers' children and 36 out of 105 female manual scavengers' children did their schooling in Government aided schools. Twenty six children of the selected manual scavengers were found to be school dropout out of which nine of them (male 4, female – 5) worked as child labor.
- The manual scavengers expressed lack of motivation, discriminations strong reason for school dropout.
- Out of 200 manual scavengers, 169 of them lived in sheeted house. It was also observed that none of them lived neither in thatched house nor in hut.
- All the manual scavengers had access to drinking water once a week from the corporation common water tap.

- It was disheartening to note that except 31 manual scavengers, the rest of the manual scavengers (male-81, female-88) used community toilets for defecation.
- The male manual scavengers between the groups of 40-49 years reported to have the lower mean height of 154cm, compared to the standard mean height of Indian adult of the same age group. Similarly through the lowest mean height of 152 cm was observed for female manual scavengers between the age group of 30-39 years, their height was in par with the standard mean height of Indian women. From the above findings it can be inferred that except male scavengers between the age group of 40-49 years, the rest of them had normal height for their age, indicating a good growth rate.
- The mean height of the manual scavengers a maximum gain in mean weight of 70 kg for the male scavengers of 40-49 years and 60 kg for females of 30-39 years was observed.
- Hence it can be inferred that the male and female scavenger between the age group of 40-49 years and 30-39 years respectively had poor height for weight indicating the possibilities of the subjects either being overweight or obese.
- Eighty five out of 200 manual scavengers were found to be overweight. Also 32 manual scavengers (male 12, female 20) were found to be grade I obese with their BMI between the range of 27.5-32.5.
- Ten manual scavengers (male 5, female 5) were found to be underweight with their BMI the less than 18. It was also observed that 68 subjects (male 44, female 24) were found have a normal BMI of 18-23.
- Seventy five out of 95 male scavengers and 44 out of 105 female scavengers were at moderate risk for obesity.

- Fifty six out of 105 female manual scavengers exhibited symptom for iron and vitamin B12 deficiency. Forty nine female scavengers had dental carries which can be attributed to their habit of chewing tobacco and beetle nuts. In spite of having a normal hemoglobin level (sub sample table XII) 37 male manual scavengers had pale conjunctivitis a common symptom for iron deficiency. Magenta tongue a classical symptom B-complex deficiency was reported in 14 males and 47 females.
- Among 95 selected male manual scavengers, 33 men had the habit of smoking. Of the 33 members 14 members smoked six cigarettes in a day at an interval of four hours. It was also noted that 24 out of 33 manual scavengers, were smoking for more than five years a potent risk factors for cardiovascular disease, cancer and diabetes.
- Forty six out of 95 male scavengers and five out of 105 female manual scavengers were found to be alcoholic. All the 46 scavengers drank brandy. Nineteen out 46 male scavengers consumed brandy every day. It was also observed that nearly 18 male scavengers consumed 500ml of alcohol every day.
- Eighty three out of 105 female manual scavengers were found to be chewing tobacco. Ninety two of women had the habit of chewing beetle nut with tobacco one of the potential risk for oral cancer. Like wise 26 men chewed tobacco of which 21 subjects chewed it once in every four hours.

Out of 30 randomly selected subsample the total hemoglobin content was found to be normal for 14 and 13 male and female manual scavengers respectively. None of the male manual scavengers were found to be anemic and also it was observed that three (mild anemic -1, moderate-2), out of 16 female manual scavengers were found to be anemic. The low prevalence rate of anemia among the selected manual scavengers can be attributed to their intake of non-vegetarian foods in general. Correlation analysis between mean dietary iron intake and total hemoglobin were found to be non-significant.

- Among the selected 30 sub-samples, random blood sugar level was normal for 13 manual scavengers (male 5, female 8) who's random blood sugar levels were within the range of 80-110mg/dl.
- It is evident that 29 out of 95 male manual scavengers 33 out of 105 female were found to be mild hypertensive. Followed by this 14 male and 17 female manual scavengers were reported to have moderate hypertension.
- Lipid profile of the 10 manual scavengers selected at random, indicated that except for one female, the cholesterol levels was normal for the rest of the subjects. Elevated level of triglyceride between the range 200-249mg/dl was observed for six manual scavengers comprising three male and female each. There is no correlation of weight with cholesterol, LDL, and HDL. But there is a significant correlation between weight gain and triglyceride.
- Out of two hundred manual scavengers 98 females and 73 males owing to lack of time to eat, consumed only 2 meal in a day and the rest of them (22 males and 7 females) consume d three meals per day.
- Habit of skipping meals among selected manual scavengers, dietary survey revealed that 41 males and 74 females skip their meals daily. Twenty four males and 14 females skipped occasionally. Only five male and nine female skipped their meals twice a week.
- The mean monthly food expenditure of male manual scavengers was found to be Rs 4,330. Whereas female spent Rs 4657 towards their food expenditure. It was also noted that men spent 1/5th of their earning (Rs 1920) towards consumption of alcohol. As part of spending their income towards repayment of debt, male and female manual scavengers shell out Rs 6115 and Rs 5638 every month.
- Rice was the staple food for all the selected manual scavengers. Wheat was consumed by 68 male and 76 female on weekly basis. Semolina and vermicelli were consumed by all the selected manual scavengers on

once a week. Cereals like ragi, maize, jowar, kambu and cholam which are rich source of fibre were not consumed by the manual scavengers.

- Redgram dhal was consumed by 25 male and 37 female twice a week in the form of sambar and kootu, whereas 14 male and 17 female consumed it thrice a week. Irrespective of all manual scavengers cowpea and horse gram was consumed once a week. Greengram dhal a known protein and B vitamin rich pulse was consumed only once in a month in the form of pongal and payasam. Bengal gram dhal, rajmah, soybean which are rich source of protein, B vitamin and fibre were not consumed by anyone.
- Green leafy vegetables like manathakali and paruppukeerai a rich source of fibre, vitamins and minerals was consumed by all the selected manual scavengers only once a week. Araikeerai and cabbage were consumed occasionally. Drumstick leaves a cheap source of iron and vitamin A was also consumed once in a month.
- Other vegetables like brinjal, broad beans, drumstick, bottle gourd or snake gourd a rich source of dietary fiber and vitamin C were consumed once a week. Owing to escalating cost of vegetables like beans and ladies finger vegetables once consumed by them regularly were now consumed occasionally depending on the cost of the vegetables.
- Like pulses, nuts and oilseeds are rich source of protein, B vitamins, vitamin E and also fat. Coconut was consumed by 61 male and 83 female on weekly basis. Twenty two male and 16 female on monthly basis. Groundnut a rich source of thiamine and nicotinic acid was consumed by 25 males and 36 females once a week and 61 male and 62 female once a month. Other nuts and oilseeds like cashew, badam and gingelly seeds are rich source of vitamin E, fat and energy were not at all consumed by all the selected manual scavengers because of their high price.
- Since spices and condiments are part of day to day cooking they are included in the meals daily.

- Milk is a good source of protein, calcium, thiamine and riboflavin. Milk was consumed by all the selected manual scavengers daily. Seven male and 12 female took curd daily. Consumption of curd by female was food to be poor and 28 female took curd occasionally. Other milk products like butter, ghee and milk powder were not at all purchased
- In sea foods fish is the predominant item by all the selected manual scavengers. Fish a rich source of quality protein and B vitamins. Other sea foods like prawn and crab were not purchased because of their high price.
- The selected manual scavengers took fleshy foods once a week. Since beef is cheaper compared to other fleshy food it was preferred more than mutton and chicken. Twenty two males and 24 female manual scavengers took egg once a week.
- Fats and oils are rich source of energy, beta carotene and vitamin E. Palm oil one of the cheapest and easily available oil in PDS was consumed by 88 male and 64 female on a daily basis and rest of them used refined oil for their cooking. Consumption of reused oil was also found to be high among this group.

Conclusion

The quality of life of the manual scavengers has to be protected not only from major issues of discrimination and social bias, but also from the health point of view. To enable this suppressed group of people to lead a healthy life, nutrition awareness and healthy lifestyle behavior should be created and re-enforced again and again to this marginalized section. Care and precautious measurement to protect the manual scavengers from direct exposure to human waste and animal waste should be enforced. Provision of gloves, mask, apron, head gears and sanitary items with periodic de-worming and immunization can prevent the manual scavengers from the risk of acquiring diseases relating to occupational hazards. Periodic nutrition education highlighting the role of

nutrients in prevention and management of both communicable and non-communicable diseases will pave way for a better quality of living.

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NUTRITIONAL CHALLENGERS OF MANUAL SCAVENGERS IN SELECTED BLOCKS OF COIMBATORE.

INTERVIEW SCHEDULE

Background Information:

1. Name of the interviewee :
2. Age :
3. Gender
   a. Male b. Female
4. Educational status
   a. Illiterate b. High school c. Higher secondary d. Others
5. Occupation
   a. Scavenging b. Coolie c. Self Employed d. Others
6. Hour of work
   a. 8 hrs b. 8-10 hrs c. 10-12 hrs d. 12-16 hrs
7. Income earned
   a. <3000 b. 3000-7000 c. 7000-10,000 d. >10,000
8. Wage details
   a. Daily b. Weekly c. Monthly Amount ________

Family History :

1. Type of family
   a. Nuclear b. Joint
2. Number of family members
   a. 3 b. 4 c. 5 d. More
3. Do your children go to school
   a. Yes b. No
4. If yes in which school are they studying
   a. Govt b. Private
5. If no what are they doing
   a. Simply at home b. Child Labour c. Others
6. If working as what
   a. Domestic helper b. Industries c. Cleaner
7. If they are drop out of school, can you give reasons :
   a. Lack of Motivation b. Discrimination c. Poverty d. Ill Health e. Others

Socio economic status :

1. Indicate the type of house you live in
   a. Thatched b. Hut c. Roofed d. Sheeted
2. Do you live in rented or own house
   a. Rent b. Own
3. Do you have access to drinking water
   a. Yes b. No
4. If yes specify the source
   a. Well b. Bore well c. Common water tap d. Corporation Water
5. At what frequency you have access to drinking water
   a. Daily b. Twice a week c. Once a week d. Once in 15 days
6. Do you have inbuilt toilet facilities in your house
   a. Yes b. No
7. If No, which one do you use
   a. Open ground b. Public toilet c. Community toilet
8. Do you own any of these
   a. Cycle b. Bike c. Auto d. other

Anthropometric Measurement :

1. Height :
2. Weight:
3. BMI :

Body composition values of a reference man and women	
Category	WHO for South Asian
Under Weight	<18
Normal	18 -23
Over Weight	23.1 – 27.5
Obesity Grade I Grade II Grade III	27.5 – 32.5 32.5 – 37.5 >37.5

4. a) Waist Circumference :

   b) Hip Circumference :

   c) Waist Hip Ratio :

Male	Female	Health risk based solely on WHR
0.9 or below	0.8 or below	Low risk
0.96 – 1.0	0.8 – 0.85	Moderate risk
>1.0	>0.85	High risk

Biological assessment

Hemoglobin

Category	Male (mg/dl)	Female (mg/dl)
Normal	12	13
Mild	11-11.9	11 – 11.9
Moderate	8 – 10	8 – 10
Severe	>7	>8

Blood Pressure

Category	Systolic	Diastolic
Normal	130	90
Mild	140 – 160	90 – 100
Moderate	160 – 200	100 – 120
Savere	Above 200	Above 120

Random Blood Sugar

Range	Values mg/dl
Low	<70
Normal	80 – 110
After Meals	Upto 140
High	>180

Lipid Profile

Range	Values mg/dl
Total cholesterol : Normal High	200 – 239 >239
HDL : Low High	<40 >60
LDL : Normal High	100 – 129 160 – 169
Triglycerides : Normal High	<150 200 - 499

Life style pattern

1. Do you have the habit of smoking
   a. Yes b. No
   A) If, yes who do you smoke

   a.Bedi b. Cigarette c. Filter Cigarette d. Cigars

   B) What is the frequency of smoking

a. 2hr once b. 4hr once c. 6hr once d. daily once

C) How long you have been smoking

a. Past 2yr b. Past 5 Yr c. More than 10yr

2. Do you consume alcohol
   a. Yes b. No

A) If, Yes mention the type
   a. Toddy b. Whisky c. Brandy d. Rum
B) Frequency of consuming alcohol
   a. Daily b. Weekly c. Monthly d. Occasionally
C) Amount of alcohol consumed
   a. 1 quarter b. Half c. Full

3. Do you have the habit of chewing Beetle nut
   a. Yes b. No

A) If Yes what do you chew
   a. Pan b. Supari c. Beetle nut d. Only tobacco
   e. Bettle nut with tobacco

B) Frequency of chewing beetle nut or tobacco
   a. 2 hr one's b. 4 hr one's c. Daily one's d. Daily twice

Clinical Examination

Jellifs table of clinical assessment

System	Normal findings	Abnormal findings	Deficiency
Skin	Pink, soft, moist turgor with instant recoil, smooth appearance	Excess fat stores, fatigue, anaemic, poor wound healing, ulcer, dry with fine lines and shedding, scaly (xerosis)	Excess calorie intake, iron deficiency, protein, vitamin c or zinc deficiency. Essential fat or vitamin deficiency.
Nails	Smooth, transulant, Slightly curved nail surface and firmly attached to nail bed, nail beds with brisk capillary refill.	Spoon – shaped (Koiloncychia)	Iron deficiency
Scalp	Pink, no lesions, tenderness, fontanels, without softening bulgig.	Dull black luster, pale molted softening or craniotabes.	Protein or iron deficiency, vitamin a or c deficiency, vitamin deficiency
Hair	Natural shine, consistency in color and quantity, fine to coarse texture.	Lack of shine and luster, sparse, easily pluckable.	Protein, Zinc or linoleic acid deficiency.
Face	Skin warm, smooth, dry, soft, moist with instant recoil.	Diffuse, pigmentation, swollen, Pallor moon face.	Protein deficiency, Iron, folate, B12 deficiency, protein, calorie deficiency.
Eyes	Evenly distributed brows, lids, lashes, conjunctiva pink without discharge sclera, without spots, cornea clear, skin without cracks or lesions.	Pale conjunctiva Night blindness Dry, grayish, yellow or white foamy spots on whites or eyes (Bitot's spots)	Iron, folate, B12 deficiency. Vitamin A deficiency Vitamin A deficiency.
Lips/Mouth		Vertical cracks of lips (cheilosis)	Riboflavin. Niacin deficiency. Riboflavin, niacin, B12 deficiency.

		Bilateral cracks, redness of lips (angular stomatitis)	
System	Normal findings	Abnormal findings	Deficiency
Tongue	Pink, moist, midline, symmetrical with rough texture.	Megenta Smooth, stick, loss of papillae. Beefy red color, atrophied taste buds and mucosa red and swollen. Decreased taste (hypoguesia)	Riboflavin deficiency. Folate, niacin, riboflavin, iron, B12 deficiency. Niacin, folate, riboflavin, iron, B12 deficiency. Zinc deficiency
Gums	Pink, moist without sponging.	Spongy, bleeding, receding.	Vitamin C deficiency.
Teeth	Repaired no loose teeth, color may be various shades of white.	Missing, poor repair, caries, loose.	Excess sugar.
Abdomen	Soft, non distended, symmetrical, bilateral without masses, umbilicus in medicine, no ascites and bowel sounds present and normo active.	Generalized symmetrical distension. Protruding everted umbilicus, tight glistening appearance (ascites)	Obesity Influences protein, fluid, sodium concerns of feeding.
Musculo skeletal	Full range of motion without joint swelling or pain, adequate muscle strength	Inability to flex, extend and rotate neck adequately. Swollen, painful joints. .Decreased range of motion swelling impaired joint mobility of upper extremities, muscle wasting on arms, legs, skin folding on buttocks.	Influences nutrition by interfering with ability to feed or make hand-to-mouth contact. Vitamin C deficiency. .Protein – caloric deficiency.

System	Normal findings	Abnormal findings	Deficiency
		Enlargement of epiphyses at wrist, ankle or knees. Bowed legs	Vitamin D or C deficiency. Vitamin D, Calcium deficiency.
Neurologic	Alert, oriented, hand-to-mouth coordination, no weakness or tremors	Decreased absence of mental alertness, inadequate hand-to-mouth coordination.	Protein, thiamine, Vitamin B12 deficiency.

Dietary Pattern

1. Diet pattern : a) Vegetarian b) Non vegetarian
2. Meal pattern : a) 1 meal b) 2 meal c) 3 meal d) 4-5 meal

Do you skip any of these

a) Breakfast b) Lunch c) Mid evening d) Dinner

If yes, Reason

a) Economic b) No time c) Do not have access to food oulets

How often you skip meals

Daily	Breakfast	Lunch	Dinner
Twice a week	Breakfast	Lunch	Dinner
Once in a week	Breakfast	Lunch	Dinner
Occasionally	Breakfast	Lunch	Dinner

Food Expenditure

Food Products	Amount	Daily	Weekly	Monthly
Rice Pulses Oil Vegetables Milk Non veg food Tea/coffee Spice				

Food Frequency :

Food Groups	Daily	Weekly	Monthly	Occasionally	Amount
Cereal and grains Rice Wheat Ragi Jowar Bajra Others Pulses and legumes Bengal gram Black gram Green gram Red gram Others Leafy vegetables Agathi Arai keerai Cabbage Mulai keerai Murungai Keerai Paruppu Keerai Ponnanganni Pulicha Keerai Siru Keerai Thandu Keerai					

Vendhaya Keerai					
Others					
Roots and Tubers					
Carrot					
Colocasia					
Onion					
Potato					
Radish					
Yam					
Others					
Other Vegatables					
Brinjal					
Beans					
Broad beans					
Drumstick					
Ladies Finger					
Sundaikai					
Others					
Nuts & Oil Seeds					
Almond					
Cashew					
Coconut					
Gingelly seed					
Groundnut					
Condiments & Spices					
Asafoetida					
Cardomon					
Chillies					
Cloves					
Cariander					
Cumin Seed					
Fenugreek					
Garlic					
Pepper					
Fruits					
Apple					
Banana					
Grapes					
Guava					
Lemon					

Mango Sapotta Others Milk & milk products Milk Curd Butter milk Sea foods Fish Crab Prawn Meat and poultry Beef Chicken Egg Mutton Pork Others Fats & Oils Gingelly oil Groundnut Oil Palm oil Refined oil Reused oil Vanspathy Ghee					

Twenty Four Hour Recall

Meal Timing	Menu Items	Amount	Raw Ingredients
Early Morning Break Fast Mid Morning Lunch Evening Dinner			

APPENDIX-II

HAEMOGLOBIN	1000 mL 5000 mL	11011001 11011002

INTENDED USE: This reagent is intended for in vitro quantitative determination of Haemoglobin in blood

- Based on cyanmethaemoglobin method.

- Linear up to 20 gm/dL.

CLINICAL SIGNIFICANCE

A decrease in haemoglobin below normal range is an indication of anaemia. An increase in haemoglobin concentration occurs in haemoconcentration due to loss of body fluid in severe diarrhoea and vomiting, High values are also observed in cogenital heart disease (Due to reduced oxygen supply) in emphysema and also in a poly cythemia. Haemoglobin concentration drops during pregnancy due to haemodilution.

PRINCIPLE

The Haemoglobin (oxyhaemoglobin, methemoglobin, Carboxyhaemoglobin) is converted to cyanmethaemoglobin according to the following reactions.

Haemoglobin $\xrightarrow{K_3Fe(CN)_6}$ Methemoglobin

Methemoglobin $\xrightarrow{KCN}$ cyanmethemoglobin.

The intensity of the colour is proportional to haemoglobin concentration and is compared to known cyan methaemoglobin standard at 540 nm (green filter)

REAGENT COMPOSITION

HAEMOGLOBIN REAGENT	1000 mL / 5000 mL
Potassium phosphate	2.0 mmol/L
Potassium ferricyanide	0.60 mmol/L
Potassium cyanide	0.90 mmol/L
sodium chloride	1.4 mmol/L
HAEMOGLOBIN STANDARD :	1x10 mL/2x10 mL
Cyanmethaemoglobin standard conc. 60 mg/dL	

STORAGE AND STABILITY

The sealed reagents are stable up to the expiry date stated on the label, when stored at room temperature & standard at 2-8°C.

LINEARITY

This reagent is linear up to 20 gm/dL.

NORMAL RANGE

It is recommended that each laboratory establish its own reference values. The following value may be used as guide line.

New born	14 - 24 gm/dL
Adult (male)	13.5-18 gm/dL
Adult (Female)	11.5-16.4 gm/dL

APPENDIX-III

GLUCOSE	R 10 x 40 mL	12053001

INTENDED USE: This reagent is intended for in vitro quantitative determination of Glucose in serum, plasma, & CSF.

- GOD-PAP methodology
- Linear up to 600mg/dL

CLINICAL SIGNIFICANCE

Glucose is a major carbohydrate present in the blood & serves as a primary source of energy. It is usually obtained from ingested starch & sugar. The glucose concentration is normally, maintained at constant level. Excessive glucose is stored as an inactive glycogen mainly in the liver., & a little in the muscles. Elevated blood glucose levels are found in diabetis mellitus, hyperthyro-idism, hyperadrenalism, & certain liver diseases. Decreased levels are found in insulinoma, hypothyroidism, hypopituitarism.

PRINCIPLE

Enzymatic determination of Glucose is based on following reaction

$$Glucose + O_2 + H_2O \xrightarrow{GOD} H_2O_2 + \text{Gluconic acid}$$

$$2H_2O_2 + Phenol + 4\text{-}Ap \xrightarrow{POD} Quinonimine + 4H_2O$$

GOD - Glucose Oxidase

POD - Peroxidase

REAGENT COMPOSITION

GLUCOSE(SL)R1	10 x 40mL
Tris Buffer,(pH7.40)	92mmol/L
Phenol	0.3mmol/L
Glucose oxidase	15000U/L
4-Aminophenazone	2.6mmol/L

STORAGE AND STABILITY

The sealed reagents are stable up to the expiry date stated on the label, when stored a t 2-8°C.

LINEARITY

The reagent is linear upto 600mg/dL

If the concentration is greater than linearity (600mg/dL), dilute the sample with normal saline & repeat the assay. Multiply the result with dilution factor.

NORMAL RANGE

It is recommended that each laboratory establish its own reference values.

The following values may be used as guide line

Serum :- Fasting	: 70-110mg/dL
2 hrs postprandial	: 70-140mg/dL
CSF	: 50-70mg/dL

PREPARATION & STABILITY OF WORKING REAG

Reagent ready to use.

PRECAUTION

To avoid contamination use clean laboratory materials. A direct exposure of reagent to light.

SAMPLE

Serum / Plasma(free of haemolysis)

CSF

CALIBRATION

Agappe multicalibrator(Code No.11610001) is recommen for calibration of this assay.

Quality Control -It is recommended to use Qualich Norm(Code No.11601100) or Qualicheck path (C No.11601200) to verify the performance of the measurem procedure.

Each Laboratory has to establish its own internal qua control scheme and procedures for corrective action controls do not recover within the acceptable toleranc

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SYMBOLS USED ON THE LABELS

- LOT — Lot Number.
- See Package Insert For Procedure.
- IVD — In Vitro Diagnostic Use.
- Manufacturer's Addre
- Temperature Limit.
- Expiry Date.
- Manufacturing Date.

APPENDIX-IV

CHOLESTEROL (S.L)

5 x 25 mL, 5 x 100 mL, 4 x 250 mL
11403002, 11403003, 11403007

INTENDED USE
This reagent is intended for in vitro quantitative determination of Cholesterol in serum or plasma.
- CHOD-PAP methodology
- Linear up to 600 mg/dL
- Contains LCF (Lipaemic clearing factor) which minimizes rerun

CLINICAL SIGNIFICANCE
It is the main lipid found in the blood, bile & brain tissues. It is also one of the most important steroids of the body & is a precursor of many steroid hormones. Two thirds of cholesterol present in the blood is esterified. The liver metabolizes the cholesterol & it is transported in the blood stream by lipoproteins.
Increased levels are found in hypercholesterolaemia, hyperlipidaemia, hypothyroidism, uncontrolled diabetes, nephritic syndrome & cirrhosis.
Decreased levels are found in malabsorption, malnutrition, hyperthyroidism, anaemia & liver diseases.

PRINCIPLE
Enzymatic colorimetric determination of total cholesterol according to the following reactions.

Cholesterol ester + H_2O --(Cholesterol esterase)--> Cholesterol + fatty acids

Cholesterol + O_2 --(Cholesterol Oxidase)--> 4-Cholesten-3- one + H_2O_2

$2H_2O_2$ +Phenol+4-Aminoantipyrine --(Peroxidase)--> - Red quinone + $4H_2O$

REAGENT COMPOSITION

CHOLESTEROL (S.L) R1	**5 x 25 mL / 5 x 100 mL / 4 x 250 mL**
Pipes buffer (pH 6.70)	50 mmol/L
Phenol	24 mmol/L
Sodium Cholate	0.5 mmol/L
4-aminoantipyrine	0.5 mmol/L
Cholesterol Esterase	> 180 U/L
Cholesterol Oxidase	> 200 U/L
Peroxidase	> 1000 U/L
CHOLESTEROL STANDARD	**1 x 4 mL**
Cholesterol std. concentration	200 mg/dL

STORAGE AND STABILITY
The sealed reagents are stable up to the expiry date stated on the label, when stored at 2- 8°C.

LINEARITY
This reagent is linear up to 600 mg/dL.
If the concentration is greater than linearity (600 mg/dL), dilute the sample with normal saline and repeat the assay. Multiply the result with dilution factor.

NORMAL RANGE
It is recommended that each laboratory establish its own reference values.
The following value may be used as guide line.
Serum / Plasma : 150 – 220 mg/dL

PREPARATION AND STABILITY OF WORKING REAGENT
The reagent is ready to use.

PRECAUTION
To avoid contamination, use clean laboratory wares.
Avoid direct exposure of reagent to light.

SAMPLE
Serum / Plasma (free of haemolysis).

GENERAL SYSTEM PARAMETER

Mode of Reaction	End point
Slope of reaction	Increasing
Wavelength I	505 (492 -550) nm
Wavelength II	630 nm
Temperature	37°C
Standard Concentration	200 mg/dL
Blank	Reagent
Linearity	600 mg/dL
Incubation time	5 min
Sample volume	10 µL
Reagent volume	1000 µL
Cuvette	1 cm light path

LABORATORY PROCEDURE

	Blank	Standard	Sample
Working Reagent	1000 µL	1000 µL	1000 µL
Standard	-	10 µL	-
Sample	-	-	10 µL

Mix, and incubate for 5 min. at 37°C. Measure the absorbance of sample and standard against reagent blank.

CALCULATION

$$\text{Cholesterol Conc. (mg/dL)} = \frac{\text{Absorbance of sample}}{\text{Absorbance of standard}} \times 200$$

BIBLIOGRAPHY
Allain, C.C., et al.; Clin.Chem 20 (1974), 470

SYMBOLS USED ON THE LABELS: IVD IN VITRO DIAGNOSTIC USE; SEE PACKAGE INSERT FOR PROCEDURE; LOT LOT NUMBER; MANUFACTURER'S ADDRESS; MANUFACTURING DATE; EXPIRY DATE; TEMPERATURE LIMIT

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CE ISO 9001 : 2008 ISO 13485 : 2003

APPENDIX-V

TRIGLYCERIDES	R1 10 x 40 mL	12054001

INTENDED USE : This reagent is intended for in vitro quantitative determination of Triglycerides in serum or plasma.

- GPO-PAP methodology.
- Linear up to 1000 mg/dL
- Contains LCF(Lipaemic clearing factor) which minimizes rerun.

CLINICAL SIGNIFICANCE

Triglycerides are simple lipids, they are formed in the liver by glycerol & fatty acids. They are transported by VLDL, LDL & constitute about 95% of fat, stored as source of energy in the tissue & plasma.

Increased levels are found in hyperlipidemias, diabetes,nephritic syndrome , hypothyroidisim. Increased levels are risk factor for arterosclerotic coronary disease, peripheral vascular disease, acute pancreatitis & hyperlipoprotenemia. Decreased levels are found in malnutrition & hyperthyroidism.

PRINCIPLE

Enzymatic determination of triglyceride is based on the following reaction:

$$\text{Triglyceride} + H_2O \xrightarrow{\text{Lipoprotein lipase}} \text{Glycerol} + \text{fatty acid}$$

$$\text{Glycerol} + \text{ATP} \xrightarrow{\text{Glycerol kinase}} \text{Glycerol-3-phosphate} + \text{ADP}$$

$$\text{Glycerol-3-phosphate} + O_2 \xrightarrow{\text{GPO}} \text{Dihydroxy acetone Phosphate} + H_2O_2$$

$$H_2O_2 + \text{4-AAP} + \text{p-Chlorophenol} \xrightarrow{\text{POD}} \text{Red quinoneimine}$$

4-AAP = 4- aminoantipyrine
GPO = Glycerol-3-phosphate oxidase

REAGENT COMPOSITION

TRIGLYCERIDES(SL)R1	10 x 40mL
Pipes buffer(pH 7.0)	50mmol/L
p-Chlorophenol	5.3mmol/L
Potassium ferrocyanate	10 µmL
Magnesium Salt	17mmol/L
4- Aminoantipyrine	0.9mmol/L
ATP	3.15mmol/L
Lipoprotein Lipase	≥ 1800U/L
Glycerol Kinase	≥ 450U/L
Glycerol-3 phosphate oxidase	≥ 3500U/L
Peroxidase	≥ 450U/L

STORAGE AND STABILITY

The sealed reagents are stable up to the expiry date stated on the label, when stored at 2-8ºC.

LINEARITY

The reagent is linear upto 1000mg/dL
If the concentration is greater than linearity (1000mg/dL) the sample with normal saline & repeat the assay. Multiply the result with dilution factor.

NORMAL RANGE

It is recommended that each laboratory should establish its own reference values.
The following values may be used as guide line.

Male 60-165mg/dL
Female 40-140mg/dL

PREPARATION & STABILITY OF WORKING REAGENT

Reagent ready to use.

PRECAUTION

To avoid contamination use clean laboratory materials.
Avoid direct exposure of reagent to light.

SAMPLE

Serum / Plasma(free of haemolysis)

CALIBRATION

Agappe multicalibrator(Code No.11610001) is recommended for calibration of this assay.

Quality Control -It is recommended to use Qualicheck Norm(Code No.11601100) or Qualicheck path (Code No.11601200) to verify the performance of the measurement procedure.

Each Laboratory has to establish its own internal quality control scheme and procedures for corrective action if controls do not recover within the acceptable tolerance.

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SYMBOLS USED ON THE LABELS

LOT Lot Number.	Manufacturer's Address.
See Package Insert For Procedure.	Temperature Limit.
	Expiry Date.
IVD In Vitro Diagnostic Use.	Manufacturing Date.

APPENDIX-VI

HDL CHOLESTEROL (D) WITH CALIBRATOR

2 x 40 mL / 2 x 60 mL / 4 x 60 mL
11414003, 12013001, 11414004

INTENDED USE

This reagent is intended for in vitro quantitative determination of HDL Cholesterol in serum

- Direct determination of HDL Cholesterol
- Enzyme Selective Protection Method
- Linear up to 150 mg/dL
- Ready to use liquid stable reagents

CLINICAL SIGNIFICANCE

Blood total cholesterol levels have long been known to be related to coronary heart disease (CHD). In recent years, in addition to total cholesterol, high density lipoprotein cholesterol (HDL-C) has become an important tool used to assess an individual risk of developing CHD since a strong negative relationship between HDL-C concentration and the incidence of CHD was reported.

PRINCIPLE

The reaction between cholesterol other than HDL & enzyme for cholesterol assay is suppressed by the electrostatic interaction between polyanions & cationic substances. Hydrogen peroxide is formed by the free cholesterol in HDL by cholesterol oxidase. Oxidative condensation of EMSE and 4-AA is caused by hydrogen peroxide in the presence of peroxidise, and the absorbance of the resulting red-purple quinine is measured to obtain the cholesterol value in HDL

Other lipoproteins than HDL —Polyanions / Cationic substances—> Suppress reaction with enzyme

HDL (cholesterol esters) + H_2O —cholesterol esterase—> HDL (free cholesterol) + Free fatty acids

HDL (free cholesterol) + O_2 + H^+ —cholesterol oxidase—> Cholestenone + H_2O_2

$2H_2O_2$ + 4-AA + EMSE + H_3 + O —Peroxidase—> Red-purple quinine + $5H_2O$

REAGENT COMPOSITION

HDL –C DIRECT R1	2 x 30 mL / 2 x 45 / 4 x 45 mL
N—Ethyl-N-(3-methylphenyl)-N'succinylethyenediame(EMSE)	
HDL –C DIRECT R2	2 x 10 / 1 x 30 / 2 x 30 mL
Cholesterol Oxidase	
4-Aminoantipyrin(4-AA)	
HDL –C DIRECT CALIBRATOR	1 x 3 mL

STORAGE AND STABILITY

The sealed reagents are stable up to the expiry date stated on the label, when stored at 2 - 8°C, protected from light. Do not freeze.

LINEARITY

This reagent is linear up to 150 mg/dL

If the concentration is greater than linearity (150 mg/dL), dilute the sample with normal saline and repeat the assay. Multiply the result with dilution factor

NORMAL RANGE

It is recommended that each laboratory establish its own reference values.

The following value may be used as guide line.

Male : 35 - 80 mg/dL
Female : 42 - 88 mg/dL

PREPARATION AND STABILITY OF WORKING REAGENT

The Reagent1 & Reagent 2 are ready to use.

Calibrator : Reconstitute with 3 mL of distilled water. Let it stand for 30 minutes at room temperature. Dissolve the content of the vial by swirling gently to avoid the formation of foam.

Stability : Reconstituted calibrator is stable only for 7 days at 2- 8°C.

PRECAUTION

To avoid contamination, use clean laboratory wares. Use clean, dry disposable pipette tips for dispensing. Close reagent bottles immediately after use. Avoid direct exposure of reagent to light. Do not blow into the reagent bottles.

SAMPLE

Fresh serum (free of haemolysis)

GENERAL SYSTEM PARAMETER

Mode of Reaction	End Point
Slope of reaction	Increasing
Wavelength I	578 nm(578-610)
Wavelength II	630 nm (630-700)
Temperature	37°C
Calibrator Con	As on the vial
Linearity	150 mg/dL
Incubation time	5 min+5 min
Blank	Reagent
Sample volume	5 µL
Reagent volume	450 µL+150 µL
Cuvette	1 cm light path

LABORATORY PROCEDURE

	Blank	Calibrator	Sample
Reagent1	450 µL	450 µL	450 µL
Calibrator	-	5 µL	-
Sample	-	-	5 µL
Mix and incubate for 5 minutes at 37°C.			
Reagent 2	150 µL	150 µL	150 µL
Mix and incubate for 5 minutes at 37°C. Measure the absorbance of calibrator & sample against reagent blank at 578nm/ 630 nm.			

CALCULATION

$$\text{HDL-C Concentration (mg/dL)} = \frac{\text{Absorbance of Sample}}{\text{Absorbance of Calibrator}} \times \text{Calibrator Concentration}$$

ALTERNATIVE PROCEDURE

Mode of Reaction	Differential
Slope of reaction	Increasing
Wavelength I	600 nm
Wavelength II	700 nm
Temperature	37°C
Calibrator Concentration	As on the vial label
Linearity	150 mg/dL
Blank	Reagent
Incubation time	5 minutes+5 minutes
Sample volume	3 µL
Reagent volume	270 µL + 90 µL
Cuvette	1 cm light path

LABORATORY PROCEDURE

	Blank	Calibrator	Sample
Reagent1	270 µL	270 µL	270 µL
Calibrator	-	3 µL	-
Sample	-	-	3 µL
Mix and incubate for 5 minutes at 37°C. Measure the absorbance (OD1) at 600 nm/ 700 nm.			
Reagent 2	90 µL	90 µL	90 µL
Mix and incubate for 5 minutes at 37°C. Measure the absorbance (OD2) at 600 nm/ 700 nm.			

CALCULATION

$$\text{HDL-C Concentration (mg/dL)} = \frac{\text{(OD2-OD1) Sample}}{\text{(OD2-OD1) Calibrator}} \times \text{Calibrator Conc.}$$

INTERFERING SUBSTANCES

Test will not be affected by:

Bilirubin up to	40 mg/dL
Ascorbic acid up to	50 mg/dL
Hemoglobin up to	500 mg/dL
Triglyceride up to	1000 mg/dL

*(when triglyceride in a sample exceeds 1000 mg/dL, dilute the sample 1+9 with saline, repeat the assay and multiply result by 10)

BIBLIOGRAPHY

1. Williams, P., et al.; High density lipoprotein and coronary risk factor, Lancet. 1:72 (1979)
2. Gordon,T., Castelli, W.P., Hjortland, M.C. et al. Am. J.Med. 62, 707-714 (1977)
3. Rifai,N.and Warnick, G.R.,Ed. Laboratory Measurement of Lipids, Lipoproteins and Apolipoproteins AACC Press. Washington, DC,USA,1994

SYMBOLS USED ON THE LABELS : IVD IN VITRO DIAGNOSTIC USE | SEE PACKAGE INSERT FOR PROCEDURE | LOT LOT NUMBER | MANUFACTURER'S ADDRESS | MANUFACTURING DATE | EXPIRY DATE | TEMPERATURE LIMIT

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CE ISO 9001 : 2008 ISO 13485 : 2003

APPENDIX-VII

LDL- C DIRECT	R1 3 x 24 mL R2 3 x 9 mL	12071001

INTENDED USE :This reagent is intended for *in vitro* quantitative determination of LDL Cholesterol in serum or plasma.

- Direct determination of LDL Cholesterol
- Enzyme selective protection method
- Linear up to 400mg/dL
- Ready to use liquid stable reagent

CLINICAL SIGNIFICANCE

Blood total cholesterol levels have long been known to be related to coronary heart disease(CHD). In recent years, in addition to total cholesterol low density Lipoprotein Cholesterol (LDL-C) has become an important tool to assess the risk of developing CHD is an individual since a strong positive relationship between LDL-C concentration and the incidence of CHD was reported. LDL Cholesterol acts as a key factor in pathogenesis of atherosclerosis and coronary artery disease.

PRINCIPLE

The LDL-C Direct is a homogenous assay. When serum is mixed with R1, amphoteric surfactants protect LDL from enzyme reactions. CHE and CO reacts with non LDL cholesterol, which is decomposed to water by catalase. R2 enables the conversion of LDL-C to hydrogen peroxide, which upon oxidative condensation with HDAOS & 4AA yields a color complex. By measuring the absorbance of this blue color complex produced, the LDL-C concentration in the sample can be calculated when compared with the absorbance of the LDL-C Calibrator.

REAGENT COMPOSITION

LDL-C DIRECT R1	**3 x 24mL**
Good's buffer pH6.8	25mmol/L
CHE	5IU/L
CO	5IU/L
Catalase	1000IU/mL
H-DAOS	0.64mmol/L
LDL-C DIRECT R2	**3 x 9.0mL**
Good's buffer pH7.1	30mmol/L
4-aminoantipyrine	3.4mmol/L
POD	20 IU/mL
Sodium Azide	0.1%

STORAGE AND STABILITY

The stored reagents are stable up to the expiry date stated on the label., when stored at 2-8°C , protected from light. Do not freeze.

LINEARITY

This reagent is linear up to 400mg/dl.
If the concentration is greater than linearity (400mg/dl) dilute the sample with normal saline & repeat the assay. Multiply the result with dilution factor.

NORMAL RANGE

It is recommended that each laboratory establish its own reference value.
The following values may be used as guidelines.

Desirable	< 130mg/dl
Borderline High Risk for CHD	130 - 159mg/dl
High Risk for CHD	> 160mg/dl

PREPARATION AND STABILITY OF WORKING REAGENT

Reagent 1 & Reagent 2 are ready to use

PRECAUTION

To avoid contamination, use clean laboratory materials. Use clean dry disposable pipette tips for dispensing. Close reagent bottle immediately after use. Avoid direct exposure of reagent to light. Do not blow in to the reagent bottles.

SAMPLE

Fresh serum(free of haemolysis)
EDTA Plasma

INTERFERING SUBSTANCES

Test will not be affected by:

Bilirubin up to	40mg/dL
Ascorbic acid up to	50mg/dL
Haemoglobin up to	500mg/dL
Triglycerides up to	1000mg/dL

(When triglycerides in a sample exceeds 1000mg/dL, dilute the sample 1+9 with saline, repeat the assay and multiply the result by 10)

CALIBRATION

Agappe multicalibrator (Code No.11610001) is recommended for calibration of this assay.

Quality Control - It is recommended to use Qualicheck Norm(Code No.11601100) & Qualicheck path ~~(Code No.11601200) or lipid control (code No.~~ 11612001) to verify the performance of the measurement procedure.

Each Laboratory has to establish its own internal quality control scheme and procedures for corrective action if controls do not recover within the acceptable tolerance.

APPENDIX VIII

FOOD FREQUENCY OF THE SELECTED MANUAL SCAVENGERS

Food Groups	Male						Female					
	Daily	Once	Twice	Thrice	Monthly	Occasioanlly	Daily	Once	Twice	Thrice	Monthly	Occasioanlly
Cereals												
Rice	95	-	-	-	-	-	105	-	-	-	-	-
Wheat	2	68	-	-	25	-	4	76	-	-	25	-
Ragi	-	-	-	-	-	-	-	-	-	-	-	-
Rava/ Vermicelli	-	95	-	-	-	-	-	105	-	-	-	-

Pulser & Legumes												
Bengal grant	-	-	-	-	-	-	-	-	-	-	-	-
Black gram	-	88	7	-	-	-	-	96	9	-	-	-
Red Gram	-	56	25	14	-	-	-	51	37	17	-	-
Horse gram	-	95	-	-	-	-	-	105	-	-	-	-
Cow pea	-	95	-	-	-	-	-	105	-	-	-	-
Green gram	-	-	-	-	-	-	-	-	-	-	-	-
Green Leafy Veg												
Agathi	-	-	-	-	-	-	-	-	-	-	-	-
Araikeerai	-	-	-	-	95	-	-	-	-	-	105	-
Cabbage	-	-	-	-	95	-	-	-	-	-	105	-
Manathakal	-	95	-	-	-	-	105	-	-	-	-	-

i												
Paruppu Keerai	-	95	-	-	-	-	105	-	-	-	-	-
Mulai Keerai	-	-	-	-	-	-	-	-	-	-	-	-
Other Veg												
Brinjal	-	95	-	-	-	-	105	-	-	-	-	-
Beans	-	-	-	-	-	95	-	-	-	-	-	105
Broad beans	-	95	-	-	-	-	-	105	-	-	-	-
Drumstick	-	95	-	-	-	-	-	105	-	-	-	-
Ladies Finger	-	95	-	-	-	-	-	105	-	-	-	-
Bottle gourd	-	83	12	-	-	-	-	91	14	-	-	-
Snake	-	95	-	-	-	-	-	105	-	-	-	-

gourd												
Others	-	-	-	-	-	-	-	-	-	-	-	-

Food Groups	**Male**						**Female**					
	Daily	Once	Twice	Thrice	Monthly	Occasioanlly	Daily	Once	Twice	Thrice	Monthly	Occasioanlly
Coconut	-	-	17	44	34	-	-	-	25	58	22	-
Ground Nut	-	-	9	16	61	-	-	-	14	22	62	-
Others	-	-	-	-	-	-	-	-	-	-	-	-
Condiments and Spices												
Asatoetia	95	-	-	-	-	-	105	-	-	-	-	-
Chilli	95	-	-	-	-	-	105	-	-	-	-	-
Corriander	95	-	-	-	-	-	105	-	-	-	-	-

Cuminceeds	95	-	-	-	-	-	105	-	-	-	-	-
Garlic	-	68	27	-	-	-	-	77	28	-	-	-
Pepper	-	68	27	-	-	-	-	77	28	-	-	-
Cardamon	-	-	-	-	-	95	-	-	-	-	105	-
Cloves	-	-	-	-	-	95	-	-	-	-	105	-
Milk & Milk Products												
Milk	95	-	-	-	-	105	-	-	-	-	-	-
Curd	7	8	11	-	-	30	12	9	23	-	-	28
Sea Foods												
Fish	-	95	-	-	-	105	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-	-
Meat Products												
Beef	-	95	-	-	-	-	105	-	-	-	-	-

Chicken or Mutton	-	95	-	-	-	-	105	-	-	-	-	-
Egg	-	67	19	9	-	-	82	17	6	-	-	-
Fats & Oils												
Ground nut oil	-	-	-	-	-	-	-	-	-	-	-	-
Refined oil	95	-	-	-	-	-	105	-	-	-	-	-
Palmoil	88	7	-	-	-	-	64	37	-	-	-	-
Reused Oil	-	12	-	-	-	-	-	18	-	-	-	-
Ghee	-	-	-	-	-	-	-	-	-	-	-	-
Vanaspathi	-	-	-	-	-	-	-	-	-	-	-	-