A STUDY OF PREVALENCE OF GOITRE AMONG SCHOOL CHILDREN IN KOLAR

by

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Under the guidance of

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LIST OF ABBREVIATIONS

APL	-	Above Poverty Line
BPL	-	Below Poverty Line
ECF	-	Extracellular fluid
FAO	-	Food and agricultural organization
ICCIDD	-	International Council for Control of Iodine Deficiency Disorders
IDD	-	Iodine Deficiency Disorders
IQ	-	Intelligence quotient
MUI	-	Median urinary iodine
NFHS	-	National Family Health Survey
NGCP	-	National Goiter control program
NGO	-	Non-Governmental Organization
NIDDCP	-	National Iodine Deficiency Disorders Control Program
OBC	-	Other Backward Class
SAC	-	School Age Children
SC	-	Scheduled Caste
SES	-	Socio Economic Status
ST	-	Scheduled Tribe
TGR	-	Total Goiter Rate
UIC	-	Urine iodine concentration
UIE	-	Urine Iodine Excretion
UNGASS II	-	United Nations General Assembly Special Session on Children II
UNICEF	-	United Nation's Children Emergency Fund
USI	-	Universal salt iodization
WHO	-	World Health Organization

ABSTRACT

INTRODUCTION

Iodine is an essential micronutrient required at 100-150 micrograms daily for normal human growth and development. Iodine deficiency leads to a much wider spectrum of disorders commencing with the intrauterine life and extending through childhood into adult life with serious health and social problems. Majority of consequences of IDD are invisible and irreversible but at the same time preventable. School-age children of 6 to 12 years are considered as an important target group for surveillance of IDD because of they are highly vulnerable, easy to access, and also their applicability in a variety of surveillance activities. Nearly 266 million school-aged children worldwide have insufficient iodine intake. IDD was a public health problem in 47countries. Sample surveys in India revealed that out of 324 districts surveyed so far, 263 districts are IDD endemic (prevalence 10 %). India has made considerable progress toward IDD elimination by implementing National Iodine Deficiency Disorders Control Programme (NIDDCP) in the year 1992. Kolar, being a drought prone area with semi-arid climate, mainly dependent on ground water for drinking has also been home for fluorosis. As there are no recent studies on the prevalence of goiter in this area, a cross sectional study was conducted.

OBJECTIVES

1) To estimate prevalence of goiter among school children.
2) To estimate the spot median urine iodine excretion and the salt iodine content in a subsample.

METHODOLOGY

A Cross Sectional Descriptive Study was conducted among school going children aged between 6 -12 years, from lower and higher primary schools in rural and urban areas of Kolar. The subjects were selected by multistage random cluster sampling technique. The total sample size was 650 children. The assessment for prevalence of goiter among school children was done using a pre-tested semi structured and pre-validated questionnaire. A sub sample of children was tested for the median urinary concentration and salt samples were tested from the households of the children.

RESULTS AND INFERENCES

The prevalence of goiter among the school children aged 6-12 years was found to be 6.6%.it was be higher in rural area (11.07%) when compared to urban area (2.15%). Most of the children of 10-12 years were found to have goiter (81.39%). followed by 8-9 years (13.95%). The female children had a higher prevalence of goiter (67.44%) when compared to males (32.55%).The goiter was more in OBC (53.48%) followed by SC/ST, 11.62% and 25.58% respectively and higher among BPL card holders (88.37%) when compared to APL (11.62%). The goiter was found to be highest among those children who belonged to nuclear family (72.09%). All the 43 children who had goiter does not have the knowledge regarding iodised salt. The median urine iodine excretion among children was found to be 135 µg/L and 88% of the children had adequate urine iodine excretion. Most of study subjects (96.3%) reported to be using packaged crystal salt and only 0.9% children had knowledge regarding iodised salt. The salt iodine content was found to be adequate (>15ppm) in 88% of the samples.

CONCLUSION

Goiter continues to be prevalent in mild endemic proportions (6.6%) in Kolar taluk, this calls for identification of factors leading to goiter despite effective implementation of universal salt iodisation. It can be considered that it is in a transition phase from iodine deficient to iodine sufficiency. As it was an important public health problem, IDD control activities should be strengthened and surveys should be done every 3-5 years to monitor the progress in eliminating IDD.

KEY WORDS: Iodine deficiency disorders, Total Goiter Rate, Urine Iodine Excretion, Kolar

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INTRODUCTION

The term Micronutrient deficiency is referred to as Hidden Hunger which constitutes of a significant component of malnutrition in developing countries. Deficiencies of iodine, iron, folic acid, vitamin A and zinc are the leading cause micronutrient deficiencies.[1] Iodine is an essential micronutrient which is required at 100-150 micrograms per day for normal human growth and development.[2]

Iodine deficiency disorders (IDD) are linked to iodine deficient soil. In the past, iodine deficiency was thought to cause only goiter and cretinism.[2] However, over the last quarter of the century, it has become more clear that iodine deficiency leads to a much wider spectrum of disorders starting with the intrauterine life and extends into childhood, then into adult life with serious social and health problems. The spectrum of diseases include goiter, brain damage, hypothyroidism, cretinism, abortion, still birth, mental retardation, psychomotor defects, hearing and speech impairment. Most of the consequences of iodine deficiency disorders are not visible and irreversible but at the same time preventable.[1]

The iodine deficiency disorders constitute one of the largest causes of preventable brain damage globally leading to psychomotor impairment and learning disabilities.[3] It is observed that the intelligence quotient is lower in children who live in iodine deficient areas when compared to those who live in iodine sufficient areas (13.5 IQ on an average).[4]

School-age children of 6 to 12 years are considered as an important target group for surveillance of IDD because they are highly vulnerable, easy to access, and also their applicability in a variety of surveillance activities. The children who are affected can be assessed for urinary iodine, thyroid size and schools act as an optimal platform for implementing appropriate educational interventions.[3]

About two billion people world wide are at risk of iodine deficiency disorders due to inadequate iodine intake. Around 266 million school children worldwide have inadequate iodine intake. IDD was a public health problem in 47countries.[5]

Sample surveys in India revealed that out of 324 districts surveyed so far, 263 districts are IDD endemic (prevalence 10%).[6] Mandatory iodization of all table salt was introduced in 1983 in an attempt to eliminate iodine deficiency. India has made considerable progress toward IDD elimination by implementing National Iodine Deficiency Disorders Control Programme (NIDDCP) in the year 1992. The central government issued a notification to ban the sale of non-iodised salt in the entire country in November 2005. This became effective from 17th May, 2006 under the Food Adulteration Act.[7]

Kolar, being a drought prone area with semi-arid climate, mainly dependent on ground water for drinking has also been home for fluorosis, as there are no recent studies on the burden of Iodine deficiency disorders in this area. Hence a cross sectional study was conducted. Such community based studies will provide a baseline data and helps in detecting cases of goiter and also helps in developing interventional measures in iodine deficient areas.

OBJECTIVES

1. To estimate prevalence of goiter among school children
2. To estimate the spot median urine iodine excretion and the salt iodine content in a sub sample.

REVIEW OF LITERATURE

3.1IODINE

Iodine was discovered by a French Chemist, Mr Bernard Curtois in the year 1811, it is a non-metallic element with an atomic weight of 126.9 g/atom and atomic number 53.[8] Iodine was discovered when Sir Bernard Curtois was producing saltpetre, to manufacture gunpowder for the Napoleon army, he was burning seaweed to isolate sodium bicarbonate.[9]Then he observed that an intense violet vapour was formed when he added sulphuric acid to the ash, this vapour got converted to crystallized form on cold surfaces. He then sent these crystals to Sir Gay Lussac, he subsequently identified it as a new element and gave the nameiodine. The word iodine is derived from a Greek word "iodes" which means violet.[10] Iodine is an essential for mammalian life, as it is an essential component of the hormones produced by the thyroid gland. Iodine is also found to benefit adrenal and immune function. In addition; it also helps in maintaining breast health.[11,12]

3.2 Homeostasis of Iodine:

Iodine is an essential component required for thyroid hormone synthesis. The iodide in the diet is absorbed by the intestines and enters the circulation. In adults, 150µg of minimum daily intake of iodine will help in maintaining normal thyroid function. The average dietary intake is about 500µg/day. The circulating iodine gets taken up by the thyroid gland which is required for thyroid hormone synthesis and then gets excreted by kidney.[13]

About 120 µg/day of Iodine enters the thyroid gland each day which then gets utilized for synthesis of thyroid hormones and their secretion. The thyroid hormone secreted by thyroid gland each day is about 80 µg/day in the form of Tri-iodothyronine(T_3) and Thyroxine(T_4), while 40 µg/day gets diffused back into the

extra cellular fluid (ECF).The circulating T_3 and T_4 are being metabolized in the liver and other tissues, and about 60 μg/day of iodine is released into the Extra Cellular Fluid. Among the derivatives of the thyroid hormones, some gets excreted in bile, and some amount of the iodine content in the mgets re-absorbed by the entero-hepatic circulation. The total amount of iodine lost in the stool is 20μg/day. Hence the total amount of iodine which enters the ECF per day is 600 μg, of which 20% enters the thyroid gland and 80% is excreted in urine.[13]

3.3 Thyroid hormones

The organification of iodide occurs at the junction between the thyrocyte and colloid. Iodide is first oxidized to iodine and is then incorporated into tyrosine at the third carbon position, which is a part of the glycoprotein called thyroglobulin. The thyroid cells synthesize thyroglobulin and are then secreted into colloid, by the process of exocytosis of granules. There fore, the thyroid hormones are produced by oxidation as well as reaction of iodine with thyroglobulin, here it remains a part of the thyroglobulin until it is needed. The thyroid gland has a reservoir for thyroid hormones in the form of colloid. Hence, humans can ingest a diet which completely devoid of iodine for a period of over two months, after which the circulating hormones start to gradually reduces. Thus, iodine is required for the synthesis of the thyroid hormones T_3 and T_4.These thyrocytes internalizes the colloid and by hydrolysis of the peptide bonds of thyroglobulin, releases the thyroid hormones into the circulation when needed.[13]

3.4Functions of thyroid hormones

The thyroid hormones affect the physiology of human body in various ways. It stimulates the metabolic rate, calorigenesis, cardiac function and normal mentation. Thyroid hormones also play a critical role in development, particularly of the nervous

system and growth. Both under-activity and over-activity of the thyroid gland result in disease. Under-activity of the thyroid gland causes hypothyroidism, which results in mental and physical slowing in adults, and causes mental retardation and dwarfism in case of neonates. Whereas over-activity of the thyroid gland, i.e. Grave's disease, which is most commonly caused by auto-antibodies that trigger the secretion will result in body wasting, nervousness and tachycardia.[13]

3.5 Source of Dietary Iodine

The soil in the upper part of the earth's crust determines the quantity of iodine present in food in which it is grown. The process of repeated flooding and glaciation results in leaching of the soil iodine, which is then carried into the sea. Hence, the sea water is a rich source of iodine. The seaweed also is a rich source for iodine because of its inherent capacity to concentrate iodine from the sea. The reef-fish which consume the seaweed are also rich in iodine. Hence, a population which consumes a diet rich in seaweed and reef fish has high intake of iodine, as in case of Japan. Therefore, the iodine intake by the Japanese ranges from 2-3 g/day. In certain parts of Asia, Africa, Latin America, and parts of Europe, the iodine intake varies from 20 to 80 mg/day. In the United States and Canada and some parts of Europe, the intake is around 500 mg/day.[14]

Average iodine content of foods (in µg/gm) [15]

Food item	Fresh basis		Dry basis	
	Mean	Range	Mean	Range
Fish (fresh water)	30	17-40	116	68-194
Fish (marine)	832	163-3180	3715	471-4591
Shellfish	798	308-1300	3866	1292-4987
Meat	50	27-97	—	—
Milk	47	35-56	—	—
Eggs	93		—	—
Cereal grains	47	22-72	65	34-92
Fruits	18	10-29	154	62-277
Legumes	30	23-36	234	223-245
Vegetables	29	12-201	385	204-1636

3.6 Goitrogens

The presence of goitrogenic substances in food items have been known for many years, but their presence was firmly established in 1929 by Chesney, who demonstrated the development of goiter in rabbits fed on cabbage.[16] Therefore, following his observations, the vegetables of the genus Brassica were found to possess goitrogenic properties. The goitrogenic principles in Cruciferae are thiocyanates and isothiocyanates. In 1949, Astwood isolated the potent antithyroid compoundfrom yellow turnips and Brassica seeds and termed it as "goitrin" which is a thioglycoside. Several staple foods like cassava, maize, bamboo shoots, sweet potatoes, lima beans are known to have Cyonogenic glycosides in them. After intake, then cyanogens gets converted into thiocyanates.[15,17]

3.7 Recommended intake of iodine[18]

Population group	Daily dose of iodine supplement (µg/d)	Single annual dose of iodized oil supplement (mg/y)
Pregnant women	250	400
Lactating women	250	400
Women of reproductive age (15–49 y)	150	400
Children < 2 years*	90	200

*Children <2 years:

- For children 0–6 months of age, iodine supplementation should be given through breast milk. This implies that the child is exclusively breastfed and that the lactating mother received iodine supplementation as indicated above.
- These figures for iodine supplements are given in situations where complementary food fortified with iodine is not available, in which case iodine supplementation is required for children of 7–24 months of age.[18]

3.8 Causes of Iodine deficiency

Iodine deficiency occurs when the intake of iodine falls below recommended the levels. It is an ecological phenomenon that occurs in many parts of the world. The various causes includes lack of adequate iodine in the soil, the main reason for this being erosion of soils in riverine areas, due to loss of vegetation caused due to clearing for agricultural production, overgrazing by livestock and tree-cutting for firewood. This results in a continued and increased loss of iodine from the soil. Hence in these regions, the ground –water and locally grown foods lack iodine. The other causes include consumption of goitrogens, this is seen commonly among the poor who are dependent on a particular type of food. Hence, iodine deficiency has various geological, socio-cultural and economic implications. Hypothyroidism results from low level of iodine intake, below the recommended levels because this leads to decreased synthesis of thyroid hormones.[19]

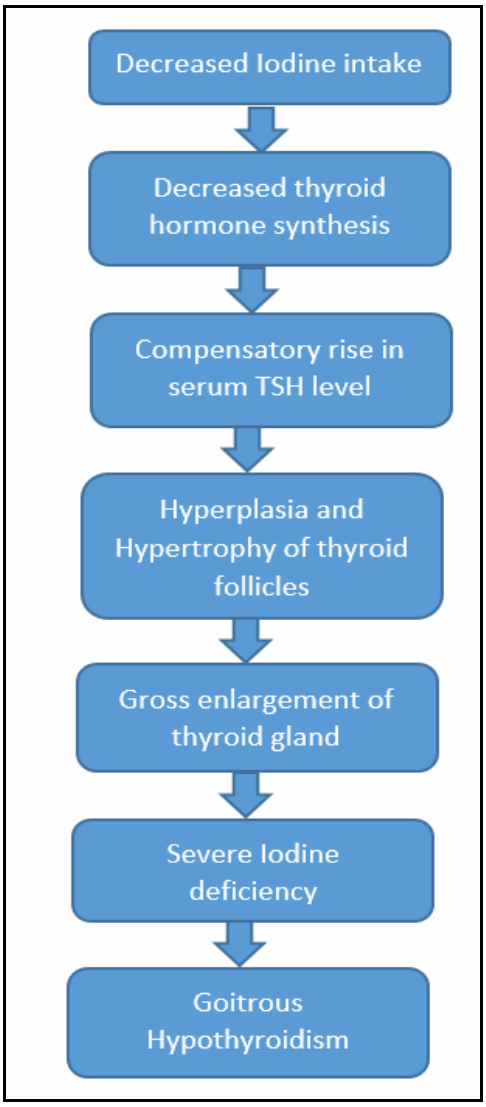
3.9 Iodine deficiency disorders:

Iodine deficiency disorders (IDD) constitute the single largest cause of preventable brain damage worldwide. The term IDD was proposed by Hetzel in 1982.Majority of consequences of IDD is invisible and irreversible but at the same time these are preventable. The entire population in India is at risk for IDD due to the soil which is deficient in iodine in this subcontinent and subsequently, even the food grown in such soil will be iodine deficient. This results in low level of thyroid hormones in the blood, which is responsible for damage to the developing brain and other harmful effects which includes a spectrum of disorders collectively known as "Iodine deficiency disorders."[19]

3.10 The spectrum of Iodine deficiency disorders (IDD)[19]

Physiological groups	Health consequence of iodine deficiency
All ages	Goitre, Hypothyroidism, Increased susceptibility to nuclear radiation
Fetus	Spontaneous abortion, Stillbirth, Congenital anomalies Perinatal mortality
Neonate	Endemic cretinism including mental deficiency with a mixture of mutism, Spastic diplegia, squint, hypothyroidism and short stature Infant mortality
Child and adolescent	Impaired mental function, Delayed physical development Iodine-induced hyperthyroidism
Adults	Impaired mental function, Iodine-induced hyperthyroidism

3.11 Pathogenesis of IDD[20]



3.12 History of Iodine Deficiency and Goiter

Evolution of Use of Iodine in the treatment of Goiter

The treatment of the swollen neck glands i.e. goiter began during the times of the ancient Greeks, they used the marine sponges. However it was in Italy, where the physicians belonging to the School of Salerno, reported the specific use of the sponge and dried seaweed to treat goiter. The sponge remained the only cure for goiter in the history of medicine through the middle Ages and the modern era. But the use of sponge in treatment of goiter was questioned by De Villanova, in the 13th century, who noted that the effect of the sponge was limited and it could cure goiter only of recent origin in the young but had a modest effect on large, chronic goiters.[21]

Later in the year 1813, Coindet, a Physician from Geneva, Switzerland, learnt about the discovery of iodine in seaweed, and hence hypothesized that the traditional treatment of goiter with seaweed or sponges was effective because of their iodine content. He began to give oral iodine tincture at an initial dose of 165 mg per day to goitrous patients, and gradually doubled the dose. Although Coindet insisted that this treatment was safe when carefully administered, this faced a lot of opposition and claimed to be poisonous by the other professionals in the medical field. [21,22]

3.13 First proposals to use iodized salt:

Boussingault, a French chemist, was the first to suggest the use of a salt rich in iodine, in order to prevent goiter. In the year 1825, Boussingault reported that the use of aceyte de sal, which is an acrid smelling fluid, taken from the villages free from goiter to the neighbouring regions reduced the endemicity of goiter in Antioquia province. Another chemist named Roulin, who worked with Boussingault, also observed that emigration to a goiter free area reduced the incidence of goiter among young people, in the region of Andes and, the converse of this, i.e. the immigrants

who travelled into areas with severe goiter also developed goiter within a span of few years. But the theory suggested by them was that, lack of oxygen in drinking water and high altitudes in the Andes because of the low atmospheric pressure to be the causes of goiter and hence they lacked knowledge on low level of Iodine in water in these regions. Therefore, the first to advocate use of aceyte de sal asprophylaxis for goiter were Roulin and Boussingault, which was in reality the salt rich in Iodine. But their vision was realized only in the next 100 years.[23]

3.14 Association of Iodine deficiency as cause of Goiter

Chatin, who was a French Chemist and Director in Paris school of pharmacy, first published his findings in 1851, regarding presence of iodine in a large number of food items and also in water sources, in Western Europe. Chatin put forth the hypothesis that deficiency of iodine caused goiter. He also advocated consumption of aquatic plants like, the water-cress, rich in iodine as a prophylaxis for goiter. Subsequent to this, he referred to the extensive work on goiter by Boussingault and then proposed the distribution of iodized salt, especially in the zones identified as goitrous in France.[24] In 1869, iodine in the form of tablets and salt were together distributed in the three goitrous areas (Bas-Rhin, Seine-Maritime, and Upper Savoy) of France, as prophylaxis for goiter. The French authorities reported that the program was very effective. This was supported by a survey including 5000 children with goiter, among whom 80% got cured or found improvements an impact of iodine treatment.[9]

However, the iodine content estimated by Chatin's original reports in food and water was very high, and hence the doses of iodine administered were calculated taking Chatin's work as base, both in table salt and tablets were too high (a concentration of 100–500 mg/kg was used to iodize salt, and the tablets, which

were administered daily, had about 100 mg Potassium iodide). Therefore, observations were made that some of the patients showed an adverse reaction even with small doses of iodine. Later on, Jodbasedow termed this phenomena as iodine-induced hyperthyroidism, was not uncommon in goitrous adults who received iodine. Whereas, the French children tolerated even high doses of iodine well, was more likely to precipitate iodine-induced hyperthyroidism in some adults. And hence, the program was discontinued.[9]

3.15 Myxoedema and cretinism

In the text by Hirsch's on pathology, in 1885, stated the theory of iodine deficiency in causation of goiter by Chatinto be of short-lived opinion, but still recommended the use of iodine for treatment of goiter. It was observed that cretinism occurred only in areas of endemic goiter. It was also found that, many of those with cretinism, had an atrophied thyroid gland and not an enlarged one as in goiter. This paradoxical observation was termed as myxoedema, which was later on described by Ord in 1877, in London. Myxoedema was found to be only in adults, especially among women. Myxoedemais characterized by swollen face, slow thinking and slow limb movements, intolerance to cold, and spade shaped hands and dry leather like skin. The thyroid gland is atrophic like in cretinism. Lack of thyroid activity as a cause of myxoedema was suggested by Semon in 1883 [25]following a report by the Kocher, a Swiss surgeon who had described the symptoms of myxoedema in certain patients following total thyroidectomy.[26,27,28]

Therefore, physicians of Great Britain successfully treated myxoedema with either injections or oral doses of thyroid extracts derived from animals. It was in 1896, when Baumann and Roos established the link between myxoedema, goiter and iodine, when they isolated 10% of residual iodine from the digested animal thyroid extracts,

in Freiburg, Germany. [29]They identified this substance to be thyroiodine, and found it to be effective in the treatment of both myxoedema and goiter. They concluded that iodine to be therapeutically active needed to be first incorporated into an organic molecule.[30,31]

3.16 Themodernera: 1930 to the present

The first estimate on prevalence of goiter was made in 1960, by WHO, it reported that globally about 20–60% of the population had iodine deficiency with or without goiter, and most of the burden was in the developing countries.[31] Even though iodine deficiency was recognized in many countries, inadequate attention was paid to address it in the various public health programs. The reason for this was that, goiter was considered as a mere lump in the neck and was more of concern only cosmetically. Hence it generated little political attention and only a few resources were provided for its control. But in the period of 1970–90, many studies in were conducted in the iodine-deficient areas which showed that supplementation with iodine, resulted in both elimination of new cases of cretinism and improved the cognitive function in rest of the population. Universal salt iodization which included for even for animal consumption improved the viability of livestock [33].Therefore, Iodine deficiency was considered to be a potential factor that could slow the development of a country as the prophylaxis against it showed to have positive implications on the social and economic front. This observation helped change the view on iodine deficiency and goiter in terms of the development perspective.

The term iodine deficiency disorders (IDD) was coined was described as a wide spectrum of related disorders, which affected around 1.5 billion individuals [31] It was found to be one of the leading causes for preventable mental retardation globally. IDD control programs received good political attention because it's benefit to humans

both socially and economically by universal salt iodization (USI) which is a cost-effective intervention. This information of low cost control of IDD was spread through various political forums and received sufficient actions and commitment.

Hence elimination of IDD has been of prime importance in most of the national and international nutrition strategies, since 1990. In the current times, iodine nutrition continues to be an area for active research, the recent studies focus on the link between excess and deficient intake of iodine and also the epidemiology of thyroid diseases. Various newer studies also concentrate on the interaction of IDD with other micronutrient deficiencies and the molecular mechanisms related to them.[32,33]

3.17 Milestones in IDD prevention: GLOBAL

In 1960, a comprehensive report was put-forth by the World Health Organization on the global burden goiter, and described the severity of the problem. However despite the elimination of IDD successfully, in a number of industrialized countries, there was little or no progress in the developing countries in the next 15 years. It was in 1974 when the World Food Council which is an international organization, proposed for the elimination of goiter in the next ten years.

In the year 1983, the concept of iodine deficiency disorders was introduced with a special importance to the effects of lack of iodine on brain function. The International Council for Control of Iodine Deficiency Disorders (ICCIDD) was formed in 1985, with a combined effort of the WHO, UNICEF and also the government of Australia. The main purpose of ICCIDD was to bridge the gap between the existing knowledge on IDD and its practical application. Later in 1987, a working group for IDD was formed by the Sub-Committee on Nutrition of the United Nations, in order to receive an Annual Progress Report.

The elimination of IDD was given main priority, in 1990, during the 43rdWorld Health Assembly, held in Geneva. The World Summit for Children at the UN, the plan for elimination of IDD by the year 2000 was formulated, which was jointly decided by 71 Heads of the State and representatives of 15 governments.

In a conference which was held at Montreal, Canada in 1991, concentrated mainly on Micronutrient malnutrition and the purpose was to throw light on "Ending Hidden Hunger." Later the nutrition commitment on ending hidden hunger was confirmed at the 45th World Health Assembly, in 1992, as well as in the WHO-FAO International Conference. In 1993, the global effort in eliminating IDD and Universal salt iodization (USI) was launched in the National Advocacy Meeting, organized by the ICCIDD, which was held in China. This effort received full endorsement of the Prime Minister in the Great Hall of the People.

There was a major gathering called SALT-2000, which involved industrialists from all over the world, involved in salt trade. The main purpose of this summit was to endorse Universal salt iodisation. The Global Network on Sustained Elimination of IDD was formed comprising of: ICCIDD, WHO, UNICEF, Salt Institute, EuSalt, Kiwanis International, Micronutrient Initiative, Emory University, US CDC. A Network to attain sustained elimination of Iodine deficiency was formed in Paris, France in the year 2001.

A draft was prepared, in 2002, by ICCIDD in partnership with the United Nations University for a Strong Endorsement of commitment by the Member States on Universal iodization of salt and to use this as a strategy to eliminate IDD. In 2003, an international meeting was held by ICCIDD including>20 health ministers, in Beijing, to discuss regarding sustained elimination of IDD. The meeting included reports on IDD from Russia, Iran, Nigeria, Ecuador, Guatemala and most of the Asian

countries. Later in May, 2005 ICCIDD worked with the World health assembly and adopted a resolution for the member states to provide a report on iodine nutrition status, every three years. In an event conducted at the United Nations General Assembly Special Session on Children II (UNGASS II), in 2007, an NGO collaborated with the UN, ICCIDD in an effort to form a Global network, which reviewed progress in IDD control in children of 20 member states.

The ninth international salt symposium, which was held in 2009, the ICCIDD leaders addressed the salt producers from the private sector, for renewal of their commitment towards USI. In 2010, the ICCIDD created "The Basil Hetzel International Award for communications on iodine nutrition" on completion of its 25 years.

At the Copenhagen consensus held in 2012, it was confirmed by the leading economists that salt iodization was one of the best strategies employed to eliminate IDD.

A global network was formed by ICCIDD in order to assist the countries to reach the goal of sustained elimination of IDD. In 2014, The ICCIDD Global Network changed its nametoIodineGlobalNetwork.[34]

3.18 Milestones in IDD prevention: INDIA

The Government of India launched a hundred percent centrally assisted program in 1962 called the National goiter control program. In 1984, the central council for health made a recommendation to the Government of India to iodate the entire edible salt in the country. In August 1992, NGCP was renamed as National Iodine deficiency disorders control program (NIDDCP) in view of covering the wide spectrum of Iodine deficiency disorders. The goal was to lower the goiter prevalence to <10% by 2012. Later in 2006, the Government of India also imposed a ban on sale

of non-iodised salt throughout the country, under the Prevention of Food Adulteration Act.[2]

3.19Problem statement of IDD: GLOBAL

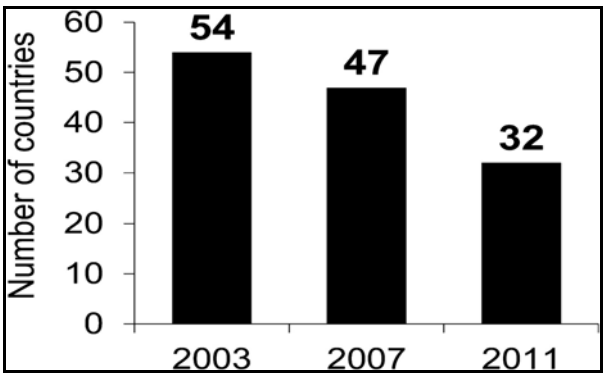
Iodine deficiency is the world's single greatest cause of preventable mental retardation. It is especially damaging during the early stages of pregnancy and in early childhood. Even mild deficiency of iodine is known to cause a significant loss of learning ability – about 13.5 intelligence quotient points at population level. It is estimated that, in developing countries, about 38 million new-borns every year remain unprotected from the iodine deficiency disorders and its consequences of brain damage.[35]

The global prevalence of goiter in the general population is estimated to be 15.8%, which varies from 4.7% in the Americas to 28.3% in Africa. When comparing current Total goiter prevalence estimates with the 1993 estimates, TGP has increased by 31.7% worldwide. All the regions experienced an increase in TGP ranging from 18.5% in South-East Asia to 81.4% in Africa except for the Americas and Western Pacific.[37]

3.20 Proportion of school age children population with insufficient iodine intake:

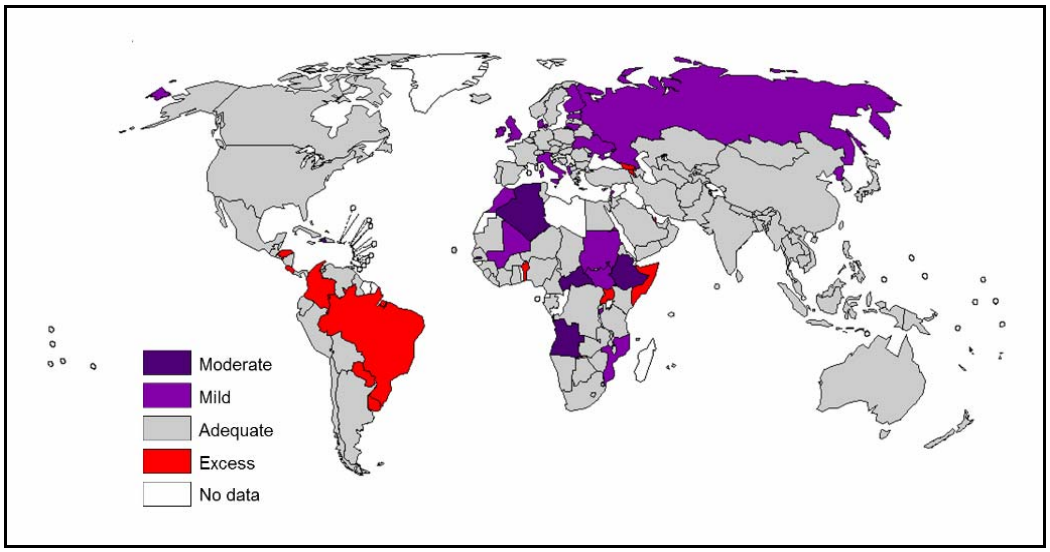
There has been a decline in the global prevalence of low iodine intake, among School age children (SAC) from 36.5% (285 million) in 2003 to 29.8% (241 million) in 2011. This large decrease in prevalence from 2003 to 2011 was observed in the Eastern Mediterranean, Europe, Southeast Asia, and the Western Pacific. But there has been a slight increase in prevalence, since 2003,in the Americas and only a little progress in Africa.[37]

Number of iodine deficient countries in 2003, 2007 and 2011



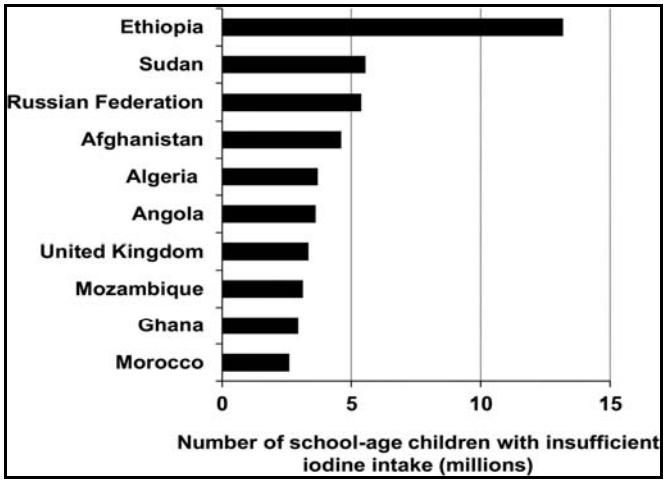
Source:[18]

It is estimated that 240.9 million children (29.8%) worldwide have an insufficient iodine intake. Among these, about 5.2% have severely deficient iodine intake whereas 8.1% have a moderately deficient iodine intake and 15.9% have iodine intake which is mildly deficient. The South East Asia region and Africa have over half of the children with low iodine in take i.e. 76 million and 58 million children respectively. The small left proportion of children with inadequate iodine intake is in the Americas (13.7%) and Western Pacific (18.6%). It was estimated that about 1.88 million of the general population had inadequate iodine intake in the year 2011, with a decrease of 6.4% since 2007. In 2011, the inadequate iodine intake was noted in 32 countries, adequate in 69, more than adequate in 36, and excessive in 11 countries. Among the countries with iodine deficiency, 23 were classified as mildly deficient and 9 to be moderately deficient in iodine intake. None of the countries were categorized as having severely deficient iodine intake.[18]



Source[18]

The top 10 iodine-deficient countries (based on national median UIC <100 µg/L) with the greatest numbers of School aged children with insufficient iodine intake in 2011



Source[13]

3.21 Magnitude of problem in India

In India about 167 million people are estimated to be "at risk" for developing Iodine Deficiency Disorders (IDD), about 55 million people have goiter and more than 8.8 million people have handicaps (mental and/or motor) related to IDD. Therefore, the burden of IDD exists throughout the country. Out of the 282 districts

surveyed by Government of India institutions like Indian Council of Medical Research and Central Goiter Survey Teams in different States and Union Territories, 241 have been found to be endemic for iodine deficiency disorders.[38]

According to the 2015-16 National Family health survey (NFHS)-3, the households using iodized salt were, 93% in urban area and 82% in rural area respectively, when compared to the 2005-6 NFHS 3levels of 86.8% in urban area and 66% in rural area. Therefore there has been a significant improvement in the consumption pattern of iodised salt at the household level. [39]

The Total goiter rates both in general population and school children in India were found to be high. The Total Goitre Rate being 26% among the general population and 19% among school children. The proportion of children born with mental impairment as a consequence of IDD is highest in India. Infact, about one-third of all children born with mental damage caused by IDD live in India, despite the fact that, there is a simple and inexpensive method of universal salt iodisation as a preventive measure for IDD.[40]

3.22 Endemicity of Goiter

The degree of iodine deficiency is expressed as a percentage of the total number of children surveyed to assess the total goiter rate. The epidemiological criteria for assessing the endemicity of iodine deficiency based on the prevalence of goitre in school-age children is as follows.[41]

Indicator	None	Mild	Moderate	Severe
Total goitre rate (TGR in%)	0–4.9	5–19.9	20–29.9	30 or more

3.23 Prevalence of Goiter by various studies

Sl. No.	Authors	Place and year of study	Total goiter rate	Grades of Goiter
1	Pandav CS et al	Delhi (Rural) 1997	20.5%	
2	Biswas AB et al	Malda, West-Bengal (rural and urban) 2002	11.3%	
3	Chandra et al	Sundarban Delta, West-Bengal (Rural) 2005	38.2%	Gradeo2:34.0% Grade 3: 4.2%
4	Patro BK et al	Jharkhand (rural and urban) 2006	0.9%	
5	Rafiq M et al	Budgam, Kashmir (rural and urban) 2006	5.57%	Grade 2: 5.40% Grade 3: 0.17%
6	Misra S et al	Panchamahal, Gujarat (rural and urban) 2007	20.5%	
7	Masoodi SR et al	Kashmir Valley (Rural) 2013	3.8%	Grade 2: 2.6% Grade 3: 1.2%
8	Kapil U et al	Pauri, Uttarakhand (rural and urban), 2014	16.8%.	

The surveys on IDD in the entire state found that four districts i.e., Chikkamagalur (41.11%), Dakshina Kannada (14.18%), Kodagu (23.12%) and Uttara Kannada (10.67%) were identified as endemic districts. The prevalence in Kolar was found to be 2.53% with a total number of 61 goiter cases in the district.[6]

Among the various studies, it was observed that the prevalence of goiter varies widely across the country ranging from 0.9%[46] to 38.2%.[49]Severe endemic goiter was reported by Chandra AK et al in the rural areas of Sundarban delta West Bengal with an overall goitre prevalence of 38.2 per cent.[42]Whereas in an extensive survey in Kashmir valley by Masoodi et al observed that iodine deficiency was not endemic as the prevalence of goiter was found to be 3.8%(<5%).[43]Similarly Batro et al observed the TGR to be 0.9% among children in Jharkhand.[44]

Kapil U et al in Pauri, Uttarakhand among school children reported a mild degree of iodine deficiency, with a Total Goitre Rate of 16.8%.[45] Similarly in Malda and Budgam district of Kashmir, Iodine deficiency was found to be of mild degree with a total goiter prevalence of 11.3% and 5.57% respectively.[46,47]

Misra et al observed that goitre was still an important public health problem in the district of Panchamahal in Gujarat, with a moderate degree of goiter prevalence, among children aged 6-12 years (TGR=20.5%).[48] A similar observation was made by Pandav CS et al in Delhi where IDD was found to be endemic even though it does not lie in the classical Himalayan goitre belt, with a goiter prevalence of 20.5%.[49]

3.24 Grades of Goiter

Chandra AK et al observed in his studies conducted in Imphal, Manipur and Sundarban delta of West Bengal, that most of the goitre was found to be Grade 2 (24.73% and 30.4% respectively) and the prevalence of Grade 3 was only 5.29% and 2.7% respectively among the children aged 6-12 years.[50,42] Similarly other studies in Churachanpur District of Manipur and Kulgam district of Jammu and Kashmir prevalence of Grade 2 goiter was found to be higher than Grade 3 goiter.[51,52]

3.25 Age

Study by Chaudhary C et al in Ambala district of Haryana, observed that the Prevalence of goitre was observed to increase with the age. The highest prevalence was found to be in the age group of 11-12 years (2.05%), the goiter rate was higher in 9 to 12 years (1.7%) age group as compared to 6 to 8 year (1.45%) age group.[53] Similar findings of increase in the goiter prevalence with age was observed in other studies also with highest prevalence among 11-12 years of age.[54,55]

Biswas AB et al in Birbhum, West-Bengal found that the prevalence was found to increase with age except for children aged 10 yrs (12.9%), with a goiter rate of 11.9% and 13% among 8 and 9 year old children respectively.[56]

Rawal SV et al in Gandhinagar district observed high prevalence of goiter in the age group 8-9 years (9.4%).[57]Whereas, another study in Kashmir, by Rafiq M et al observed that the rate of goiter was found to be more among 12yrs age group (9.75%) followed by 7.57% among 11yrs age group.[47]

Chandwani HR et al,in Bharuch, Gujarat, observed that the prevalence was more among 6yr old children (24%) than among 12 years (20.7%) and was highest in nine year old children (29.2%).[58]

3.26 Sex:

Study by Yadav S et al, in Northern India observed a higher prevalence of goitre among females (29.4%) when compared to males (32.8%).[59] Other studies in Bahrain by Moosa K et al and in Chamarajnagar district by Zama SY et al made similar observations of a greater prevalence of goiter among female children than males.[60,61]

3.27 Religion:

Sen TK et al,in West Bengal, found that the TGR did not differ significantly between Hindu (21.5%) and Muslim (17.5%).[62]Similarly,DK Das et al in Dinajpur and Howrah district of West Bengal observed that there was no significant difference in TGR between Hindus and Muslims (18.9% versus 17.6%).[63,64]

3.28 Place of Residence:

Sen S et al in Bardhaman district, West-Bengal observed that the total goiter rate in children belonging to rural areas (37.1%) was significantly higher than those from urban areas(29.4%).[65] However Sen TK et al found that there was no difference of the TGR by zone of residence (22% in rural area versus 17% in urban area).[62]

3.29 Socio-economic status:

Singh MB in Jodhpur, Rajasthan observed that the proportion of households consuming adequate iodized salt was decreasing with decline of income i.e., 15.7% in Low income group when compared with 22.7% in high income group. It was also observed that children with deficient urinary iodine excretion levels were increasing with decline of income. [66]Similarly in urban slums of Cuttack, Orissa, Panigrahi A et al found that the iodine deficiency in the salt samples was marked more in households with low monthly per capita income.[67]

3.30 Type of salt:

Raveesh P M et al in Gulbarga, observed that out of 195 salt samples, 21.02% were unpacked crystal salts, 61.02% samples were powdered packed salt and 17.94% samples were packed crystal salt.[68] Similarly Khatiwada S et al observed in Nepal, that majority (85%) used iodised powdered salt and only 15% used crystal salt.[69]

Whereas Kibatu G et al in Metekel zone of Ethiopia observed that 28% of the households used fine salt and 72% used coarse salt.[70]

3.31 Urine iodine:

Kapil U et al in Bharatpur district of Rajasthan, reported that median Urinary iodine excretion was 200.0 mcg/L. 90% of the children had UIE >100mcg/L indicating adequate iodine intake whereas 10% had inadequate UIE, indicating inadequate iodine intake.[71]Similarly other studies by Kapil U et al in Andaman district, and by Dodd NS et al in Bombay observed that 90.9% and 88% of children had UIE >100 mcg/L respectively.[72,73]

Whereas Sethy PGS et al reported that in urban slums of Bhubaneswar, the median urinary iodine concentration was only 50µg/L and 85.7% of children had UIE less than 100 µg/L, only 14.3% of children showed normal UIE.[74] Similarly in

Bharuch district of Gujarat and Nainital only 56.4% and 38.3% of the children had UIE >100mcg/L.[60,75]

In Sundarbans, West-Bengal, it was found that median urinary iodine level in the studied areas was 225 mg/l, 76.7% of the children had adequate UIE whereas 23.3% had UIE below 100mcg/L.[42] Whereas PB Jagirdar et al in Kolhapur district of Maharashtra, observed that only 19.8% of the samples had adequate UIE whereas 80.2% samples had inadequate UIE.[76]

3.32 Salt Iodine

Das et al in Chandigarh observed that the mean iodine content of salt in 321 samples was 36.47 ± 6.44 ppm, majority (98.1%) of the samples had adequate iodine content (>15ppm).The knowledge regarding presence of iodine in salt among parents showed that, 82.4 per cent knew that the salt they used in their houses contained iodine.[77]Similarly in Kangra, Himachal Pradesh Kapil U observed that majority (82.3%) of the families were consuming adequately iodised salt.[78]

Whereas in the basin of the river Ganga and the Bay of Bengal in the Howrah and Purba districts showed that only 66.4% of households were consuming salt with adequate iodine.[79]

Similarly Banumathi PG and Panigrahi et al observed that only 40.2% and 60.1% of the salt samples had adequate iodine respectively.[66,80] Other studies in Coastal Karnataka and Purulia also observed that majority of the salt samples was inadequately iodised (48.3% and 33.3% respectively).[81,82]

In Jodhpur, Rajasthan, it was observed that majority of children consumed inadequately iodized salt which indicates that the consumption of iodized salt in desert area is extremely low in spite of the national programs in operation.[67]

METHODOLOGY

4.1 STUDY AREA

Kolar district is a drought prone district with minimal rainfall, located in Karnataka state, India, in the southern region of the state. The land covered by forest is less than 14%. The drinking water requirements in the district are met by ground water resources (Bore wells) in 90% of the area. Kolar district is endemic for fluorosis with about 16% of the villages being affected by excess fluoride concentration in ground water ranging from 1.5-4.05 milligram/litre. Kolar district is known for "silk, milk and gold," the main occupation in the communities being agriculture and livestock. There is an intense cultivation of mulberry for silk worms. The other agricultural practices are horticulture and floriculture. Among the unorganized sectors quarrying, stone crushing, manufacturing bricks and roof tiles are a major source of income in Kolar.[83]

The total population of Kolar District is 15, 40,231 with sex ratio of 976 females per 1000 males, as per the 2011 census. The effective literacy of the district was 74.33% and female literacy of 66.56%. The language spoken by majority of the people is Kannada and a significant proportion of the population also speak Telugu in the regions bordered by Andhra Pradesh and Tamil in KGF.[84]

There are five taluks in Kolar district which includes, Srinivaspur, Bangarpet, Kolar, Mulbagal and Malur. The present study was undertaken in schools of Kolar taluk, including the students from both rural and urban areas. There are a total of 314 lower primary and 355 higher primary schools in Kolar taluk. The total enrolment in lower and higher primary schools is 46,761 and 26,962 children respectively. The school enrolment percentage of children aged 6-14 years in the taluk being 99.9% as

per 2014-15 data provided by the Education department, Kolar taluk, with only 20 children(10 girls and 10 boys) being out of the school.[84]

4.2 Study Population:

School going children aged between 6-12 years were included from lower and higher primary schools in rural and urban areas of Kolar.

4.3 Study Period:

1st November 2014 to 31st October 2015 (one year)

4.4 Study Design:

Cross-sectional descriptive study

4.5 Inclusion Criteria:

School Children in the age group of 6-12 years were included.

4.6 Sample size calculation:

The sample size of the school children aged 6-12 years for this study was calculated by considering the prevalence of goiter among the school children as 30% from a previous study conducted in Belgaum by Kamath et al. [85]The absolute error for the sample size calculation was considered as (d=5%), at 95% confidence interval & α (alpha) error of 5%. Since multistage cluster random sampling technique was used, a design effect of 2 was multiplied to get the final sample size.

The formula $n= Z_{\alpha}^2 p q/d^2$

Calculation: $n= (1.96)^2pq/d^2$

[Prevalence (p) = 30%, q= (100-p) = 100-30 =70, d=5%]

n= 322 * 2 =644

The total sample size calculated was 644 which was rounded upto 650.

4.7 Sampling method:

The study was conducted in the lower and higher primary schools (clusters) of Kolar taluk. A sample of 325 students was selected from each urban and rural schools of Kolar taluk making a total sample size of 650 students.

Multistage cluster random sampling technique was used to select study sample. In consultation with the Assistant Education Officer, the list of lower and higher primary schools (clusters) of Kolar taluk was compiled. Using population interval, 20 schools were selected (10 urban and 10 rural). The total number of children in classes 1 to 6 was serially numbered in each school. Using simple random sampling method 325 children each were selected in urban and rural schools on the basis of average class strength.

The schools selected and the number of children selected from each school has been enumerated in **Annexure – VI**.

4.8 Study Tool:

The assessment for prevalence of goiter among school children was done using a pre-tested semi structured and pre-validated questionnaire. The proforma had three sections:

Section A

Interview conducted to collect the demographic data which included baseline information of the children such as age, gender, religion, educational status, scholastic performance and socio-economic status of children.

The questionnaire was duly filled by the investigator by interviewing the children and by consulting the appropriate school records. If the child which was enlisted was found to be absent on the day of school visit and interview and revisits were made to ensure the child included in the study.

Section B

Clinical examination for presence of goiter as per the standard of WHO guideline for classification of goiter by palpation.

Detection of goiter by palpation: Technique

The term 'goiter' referred to an enlarged thyroid gland. A thyroid gland is considered goitrous when each of its lobes have a volume which is greater than the terminal phalanges of the thumb of the person being examined.

The child to be examined was made to stand in front of the examiner and then the neck region is carefully observed for any sign of visible thyroid enlargement. The child was then asked to look up, so as to fully extend the neck. By this method, the thyroid gets pushed forward and made any enlargement of the thyroid gland more obvious.

Palpation

The examiner palpated the thyroid, by gentle sliding of the thumb along the side of the trachea, between the cricoid cartilage and the top of the sternum. Both sides of the trachea were checked. The size and consistency of the thyroid gland was carefully noted.

As per requirement, the subject was asked to swallow during examination – the thyroid moves up on swallowing. The size of each lobe of the thyroid was compared to the size of the tip of the thumb (terminal phalanx) of the child being examined.[87]

Goitre was graded as Grade 0 (No goiter), Grade 2 (Visible goiter) and Grade 3 (Palpable goiter).[41] **(Annexure – VIII)**

Section C

Estimation of Urinary Iodine Excretion

Method

Sandell-Kolthoff Method for estimation of urinary iodine.

Principle

The Sandell-Kolthoff reaction:

Ammonium persulfate digests urine using Iodide as catalyst, itreduces ceric ammonium sulfate which is yellow in colour to its cerous form which is colourless. This is detected by the rate of disappearance of the colour.

Instrumentation

Boiling water bath, spectrophotometer, thermometer, test tubes, conical flasks, reagent bottles, and pipettes and weighing balance.

Reagents

1. Ammonium persulfate of analytical grade [$H_2N_2O_8S_2$]
2. Arsenic trioxide[As_2O_3]
3. Sodium chloride[NaCl]
4. Sulphuric acid [H_2SO_4]
5. Ceric ammonium sulphate hydrate [$Ce(NH_4)_4(SO_4)_4 \cdot 2H_2O$]
6. Deionized water[H_2O]
7. Potassium iodate [KIO_3]

Procedure

a. **Ammonium persulfate solution:** 114.1 g of ammonium persulfate was dissolved in water, and made upto 500 ml by adding additional water as required. The solution was kept away from light.

b. **5 Normal(N) Sulphuric acid:** 139 ml of concentrated (36 Normal) Sulphuric acid was slowly added to 700 ml of deionized water. When its cool, additional deionized water was added to make a final volume of 1 litre.

c. **Arsenious acid solution:** 20 grams of arsenic trioxide and 50 grams of sodium chloride was placedin a 2 litre Erlenmeyer's flask, then 40 ml of% normal(N) Sulphuric acid was slowly added. Then a litre of water was added and gently heated to dissolve. Then it was cooled to room temperature.

d. **Ceric ammonium sulphate solution:** The solution was prepared by dissolving 48 grams of ceric ammonium sulphate in 1 litre of 3.5 N Sulphuric acid. It was prepared by slowly adding 97 ml concentrated (36 N) Sulphuric acid to about 800 ml of deionized H_2O) and once this got cooled, additional amount of deionized water was added to get a volume of 1 litre). This solution was later stored away from light in a dark coloured bottle at room temperature.

e. **Standard iodine solution, 1 microgram iodine/ml (7.9 µmol/l):** 0.168 mg of Potassium iodate was dissolved in deionized water to get a volume of 100 ml (1.68 mg KIO_3 contains 1mg iodine). It was stored in a dark bottle. The standards used were 20, 50, 100, 150, 200, and 250µg/l.

5. Procedure

1. Urine was mixed to suspend sediment.
2. 250 µl of each of the urine sample was pipetted into a test tube (13 x 100 mm).
3. Then each iodine standard was pipetted into a test tube, and then water was added to make a final volume of 250 µl. Iodine standards were duplicated and a set of internal urine standards should were included in each assay.
4. 1 ml of 1.0 M ammonium persulfate was added to each tube.

5. All tubes were heated for 1 hour at 100°C. Then cooled them to room temperature.
6. Then 2.5 ml arsenious acid solution was added by mixing by inversion or vortex and let it stand for 15 minutes.
7. Then 300 µl of ceric ammonium sulphate solution was added to each tube and quickly mixed at 15 to 30 seconds intervals between successive tubes using a stopwatch.
8. Then it was allowed to sit at room temperature and exactly 30 minutes after the adding ceric ammonium sulphate to the first tube, its absorbance was readat 420 nanometre. The successive tubes were read at the same interval as and when ceric ammonium sulphate was added.

6. **Calculation of results**

A standard curve was constructed on graph paper by plotting iodine concentration of each standard on the abscissa against its optical density at 405 nm.

Sl.No	Concentration of Iodine standard	O.D value at 405 nm
1	Blank	0.00
2	50 µg/L	0.75
3	100 µg/L	1.51
4	150 µg/L	2.13
5	200 µg/L	3.01
6	250µg/L	3.85

Urine sample collection:

In the current study spot casual urine samples were collected by using plastic bottles with screw caps, of 10ml capacity. A drop of toluene was added to each sample to reduce bacteria; growth and bad odour. The urine samples were transported

to the lab and refrigerated at 4 degrees Celsius, until the time of analysis. All samples were analysed with 2 days of collection.[87]

The median urine iodine levels among school aged children 6 years and older was interpreted as follows.

Median urinary iodine (µg/L)	Iodine intake	Iodine status
<20	Insufficient	Severe iodine deficiency
20–49	Insufficient	Moderate iodine deficiency
50–99	Insufficient	Mild iodine deficiency
100–199	Adequate	Adequate iodine nutrition
200–299	Above requirements	May pose a slight risk of more than adequate iodine intake in these populations
≥300	Excessive	Risk of adverse health consequences (iodine-induced hyperthyroidism, autoimmune thyroid disease)

Estimation of Iodine Content of Salt

Semi-quantitative Spot Testing Kit (STK), which detects salt iodine content as 0 ppm (no iodine), <15 ppm (inadequate), >15 ppm (adequate)

4.9 Statistical Analysis:

The data was collected using a pre-tested structured questionnaire. The data was entered into Microsoft excel spread sheet. The qualitative variables were coded.

The collected data was summarized and presented as frequencies, proportion, mean and standard deviation, depending on the quantitative or qualitative variables. Analysis was performed using SPSS 22 version. Chi square was the test of significance for qualitative data. Independent t-test/Z-test was the test of significance for quantitative data between two groups. Analysis of variance(ANOVA) was the test of significance for quantitative data between three or more groups. Post Hoc

Bonferroni was used to find the difference between the groups after ANOVA, p value less than 0.05 was considered as statistically significant.

4.10 Ethical consideration

The study received approval by the Institutional research review board and the ethical review board of Sri Devaraj Urs Medical College, Kolar.

Verbal informed consent was obtained from the participants and their guardians before proceeding the study. Anonymity of the respondents at all stages of data analysis was maintained. Consent from district education officer and school head master or principal was also taken before conducting the study.

RESULTS

Table 1: Distribution of the Study Subjects according to sex and residence

Sex	Rural	Urban	Total
Male	181(55.69%)	157(48.30%)	338(52.0%)
Female	144(44.30%)	168(51.69%)	312(48.0%)
Total	325	325	650

A total of 650 students were included in the study, there was almost equal distribution of boys and girls (52% and 48% respectively). Similarly the distribution of boys and girls according to the areas of residence was almost equal.

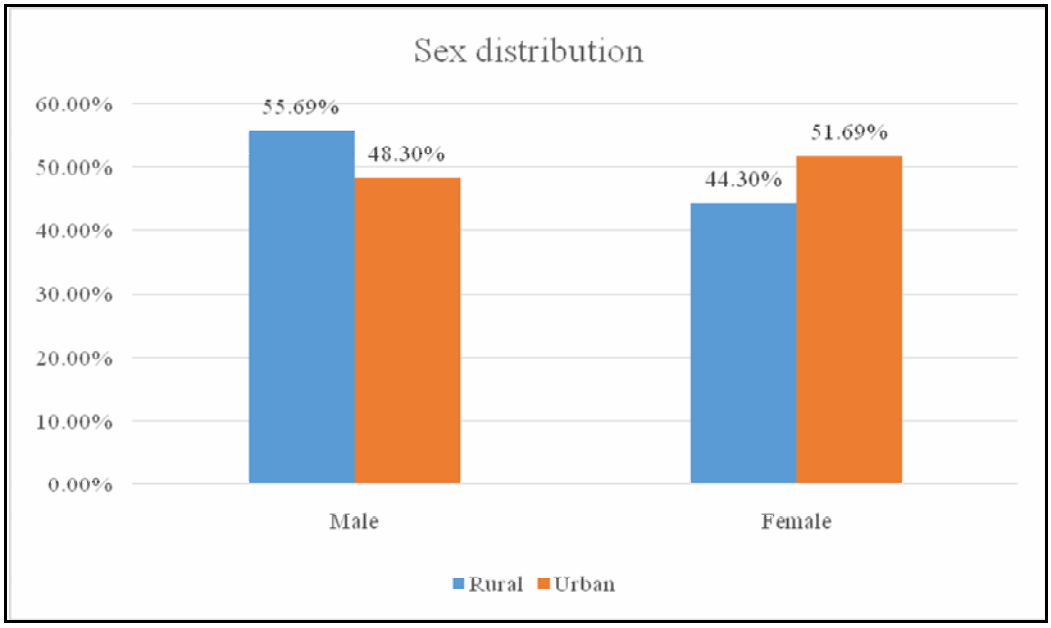


Figure 1: Bar diagram showing Sex distribution of study subjects

Table 2: Distribution of the Study Subjects according to age and residence

Age	Rural	Urban	Total
6-7yrs	97(29.84%)	105(32.30%)	202(31.07%)
8-9yrs	91(28.00%)	110(33.84%)	201(30.92%)
10-12yrs	137(42.15%)	110(33.84%)	247(38.00%)
Total	325	325	650

The age distribution of the study subjects showed that the majority of the children belonged to 10-12 years age group (38%) followed by 6-7years and 8-9years. (31% and 30.9% respectively). There was equal distribution of the children in different age groups when analysed according to areas of residence.

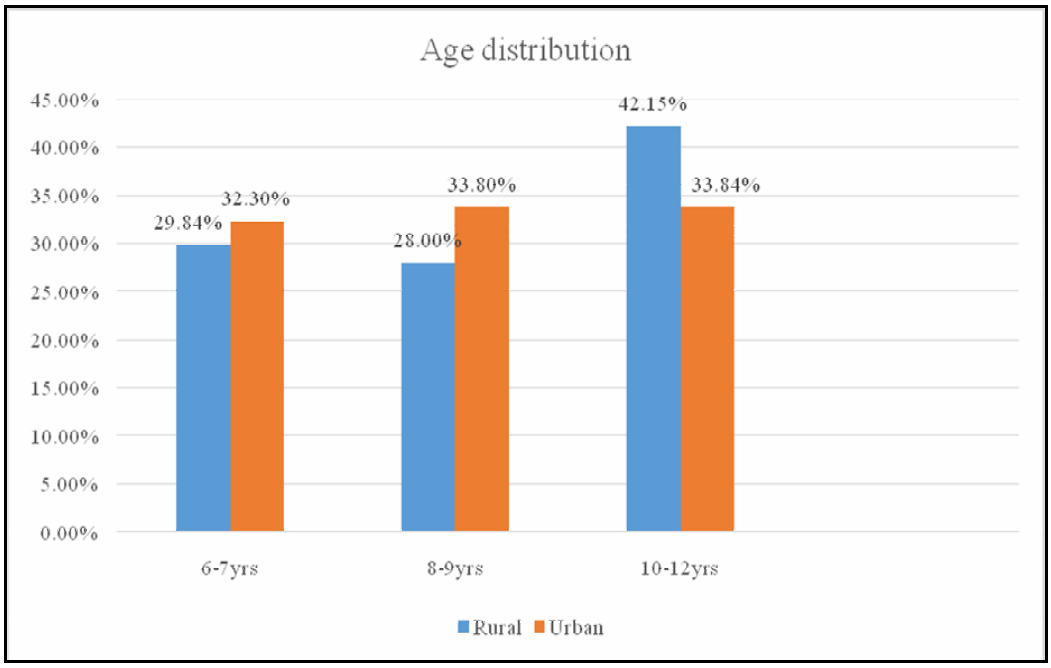


Figure 2: Bar diagram showing Age distribution of study subjects

Table 3: Distribution of Children according to religion and residence

Religion	Rural	Urban	Total
Hindu	288(88.61%)	264(81.23%)	552(84.9%)
Muslim	37(11.38%)	60(18.46%)	97(14.9%)
Christian	0(0.0%)	1(0.30%)	1(0.2%)
Total	325	325	650

Majority of study subjects were Hindus (84.9%) and only 14.9% were Muslims and 0.2% Christians. The minority subjects were more in urban areas when compared to rural areas.

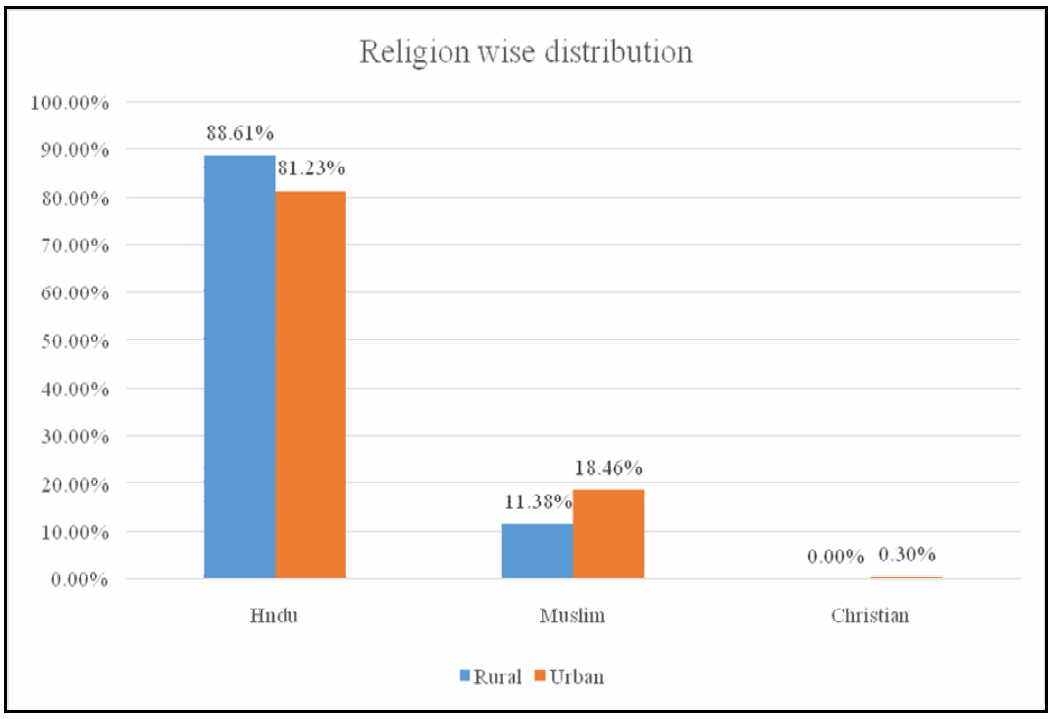


Figure 3: Bar diagram showing Religion wise distribution of study subjects

Table 4: Distribution of students according to social category and residence

Caste	Rural	Urban	Total
General	25(7.69%)	66(20.30%)	91(14.0%)
SC/ST	123(37.84%)	121(37.23%)	244(37.5%)
OBC	177(54.46%)	138(42.46%)	315(48.5%)
Total	325	325	650

The social category of the study subjects showed that most of them (48.5%) belonged to other backward class (OBC), while 37.5% and 14.0% belonged to SC/ST and general categories respectively. Majority of the study subjects in urban (42.46%) and rural (54.46%) areas belonged to OBC. The general category was more in urban areas (20.30%).

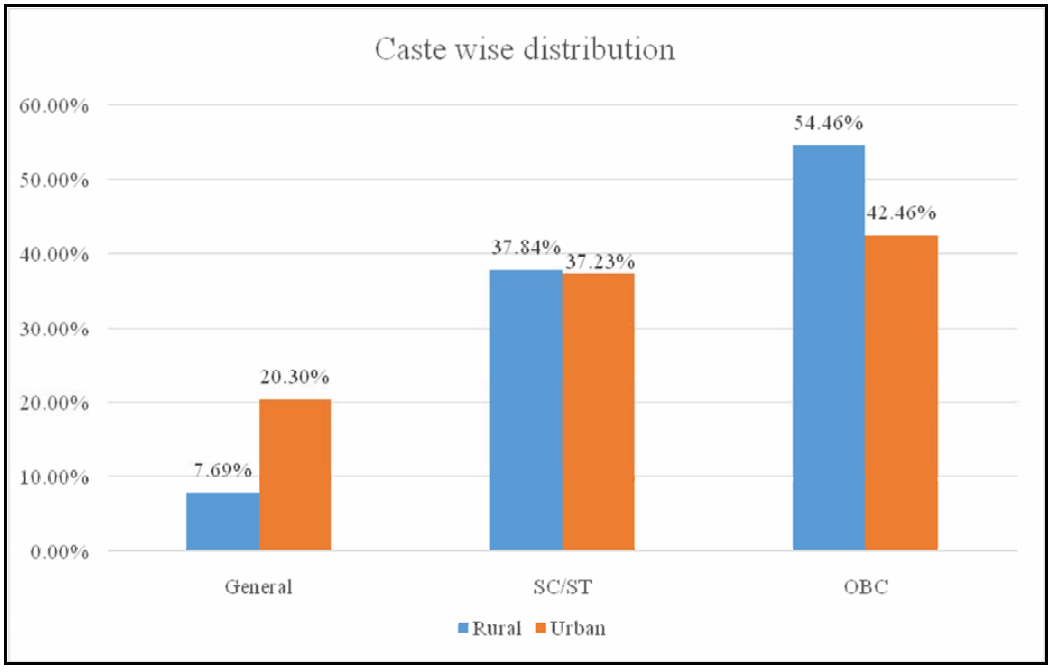


Figure 4: Bar diagram showing social category wise distribution of study subjects

Table 5: Distribution of children according to economic status

BPL/APL	Rural	Urban	Total
BPL	286(88.00%)	115(35.38%)	401(61.7%)
APL	39(12.00%)	210(64.61%)	249(38.3%)
Total	325	325	650

The majority of the children (61.7%) belonged to below poverty line and 38.3% belonged to above poverty line. In rural area, most of the children belonged to BPL (88%) where as in urban areas most of the children belonged to APL (64.6%).

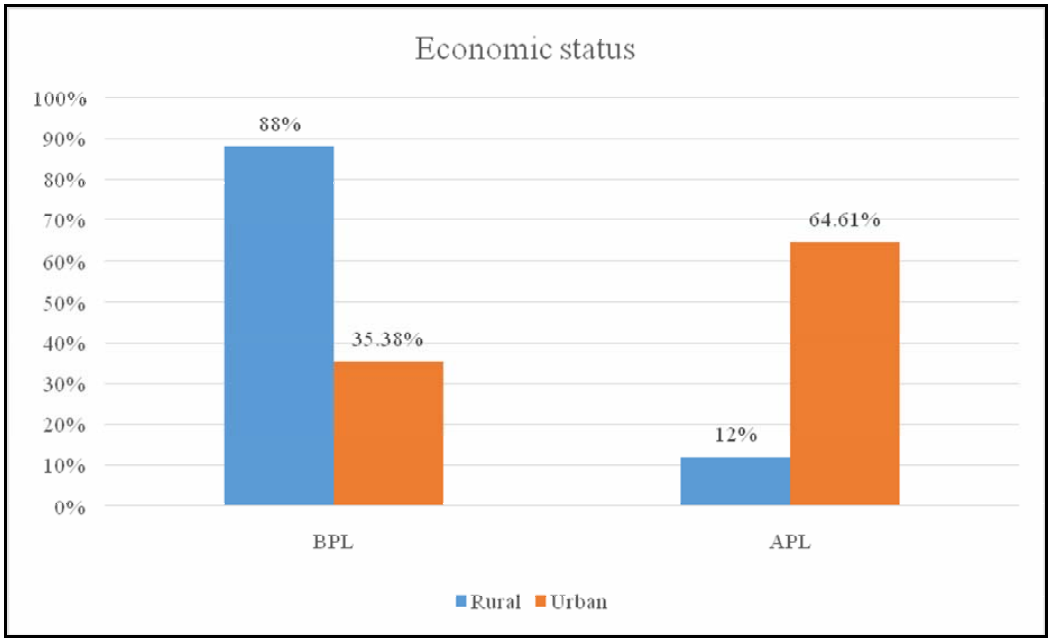


Figure 5: Bar diagram showing Economic status distribution of study subjects

Table 6: Distribution of subjects according Socio-Economic status according to Modified B.G. Prasad Classification

SES	Rural	Urban	Total
High	3(0.92%)	78(24.00%)	81(12.5%)
Upper middle	36(11.07%)	132(40.61%)	168(25.8%)
Lower middle	116(35.69%)	73(22.46%)	189(29.1%)
Lower	170(52.30%)	42(12.92%)	212(32.6%)
Total	325	325	650

The distribution of socio-economic status showed that most of them (32.6%) belonged to lower class followed by lower middle (29.1%) and upper middle (25.8%) according to Modified B.G. Prasad classification .Among the rural subjects, 52.3% belonged to lower class where as in urban areas (40.6%) subjects belonged to upper middle class.

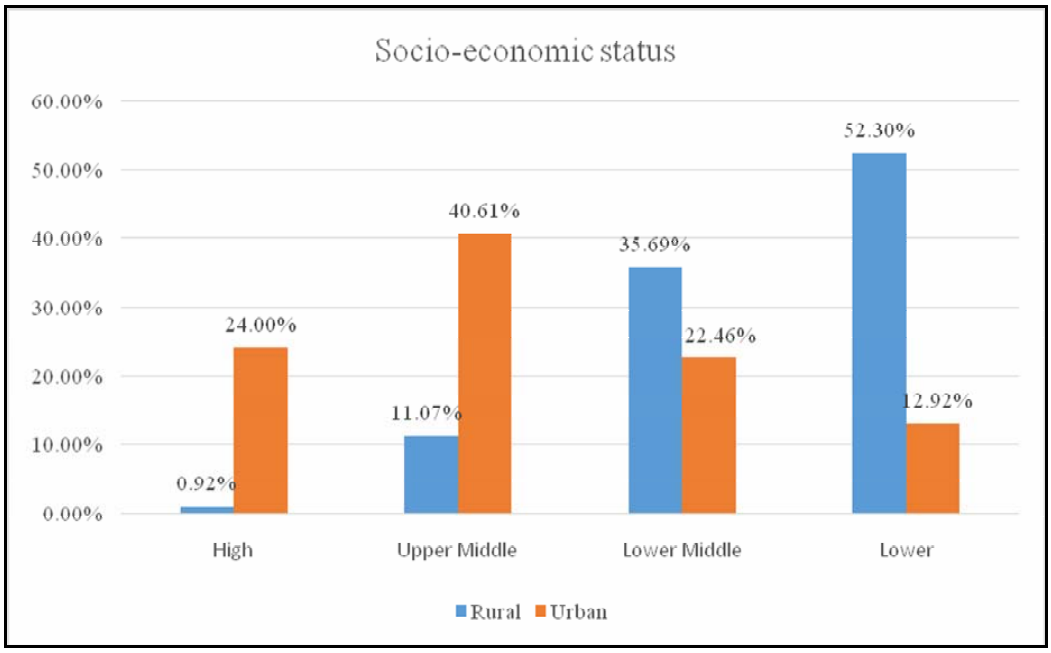


Figure 6: Bar diagram showing Socio-Economic status distribution of study subjects according to modified B.G. Prasad Classification

Table 7: Distribution of Study subjects according to birth order

Birth order	Rural	Urban	Total
1	106(32.61%)	131(40.30%)	237(36.5%)
2	186(57.23%)	157(48.30%)	343(52.8%)
3	25(7.69%)	26(8.00%)	51(7.8%)
4	8(2.46%)	9(2.76%)	17(2.6%)
5	0(0.0%)	2(0.61%)	2(0.3%)
Total	**325**	**325**	**650**

The distribution of study subjects according to birth order, showed that, most of the children (52.8%) were of birth order 2. The stratification according to residence showed that most of the children were of birth order 2, in rural (57.23%) and urban area (48.3%).

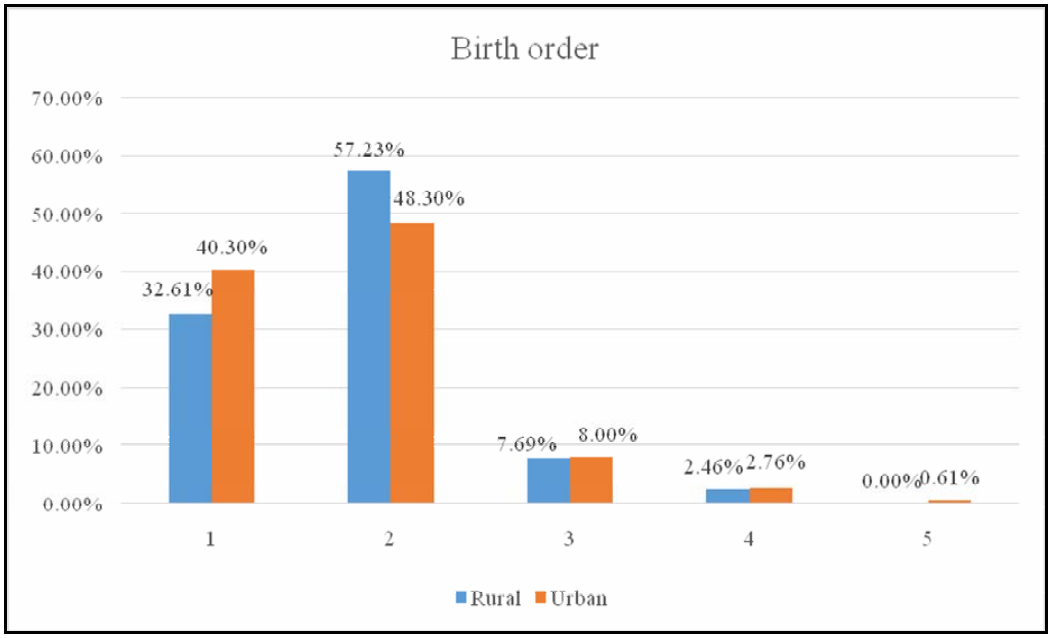


Figure 7: Bar diagram showing distribution of study subjects according to Birth order

Table 8: Distribution of Study subjects according to Type of family

Type of family	Rural	Urban	Total
Nuclear	248(76.30%)	231(71.07%)	479(73.7%)
Joint	27(8.30%)	21(6.46%)	48(7.4%)
Three generation	50(15.38%)	73(22.46%)	123(18.9%)
Total	325	325	650

Most of study subjects (73.7%) belonged to nuclear family. Similar distribution observed when analysed according to the residence of children.

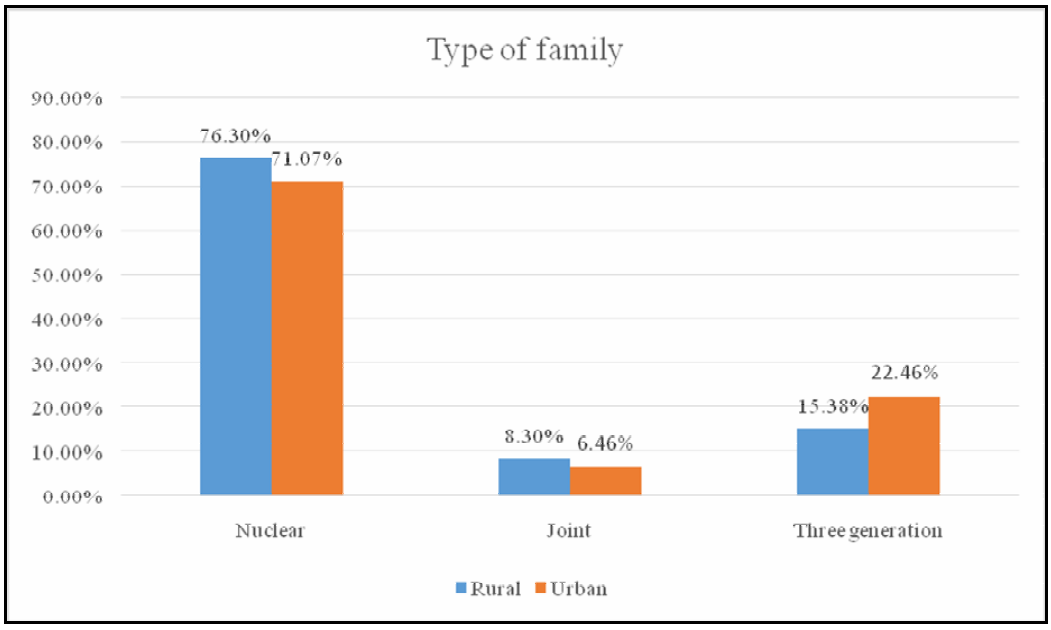


Figure 8: Bar diagram showing distribution of study subjects according to type of family

Table 9: Distribution of Study subjects according to size of family

Family size	Rural	Urban	Total
1-4	157(48.30%)	159(48.92%)	316(48.6%)
5-10	163(50.15%)	162(49.84%)	325(50.0%)
>11	5(1.53%)	4(1.23%)	9(1.4%)
Total	325	325	650

According to family size distribution of study subjects, it was observed that most of the children belonged to family size of 1-4 (48.6%) and 5-10 (50%). Similar distribution observed when analysed according to the residence of children.

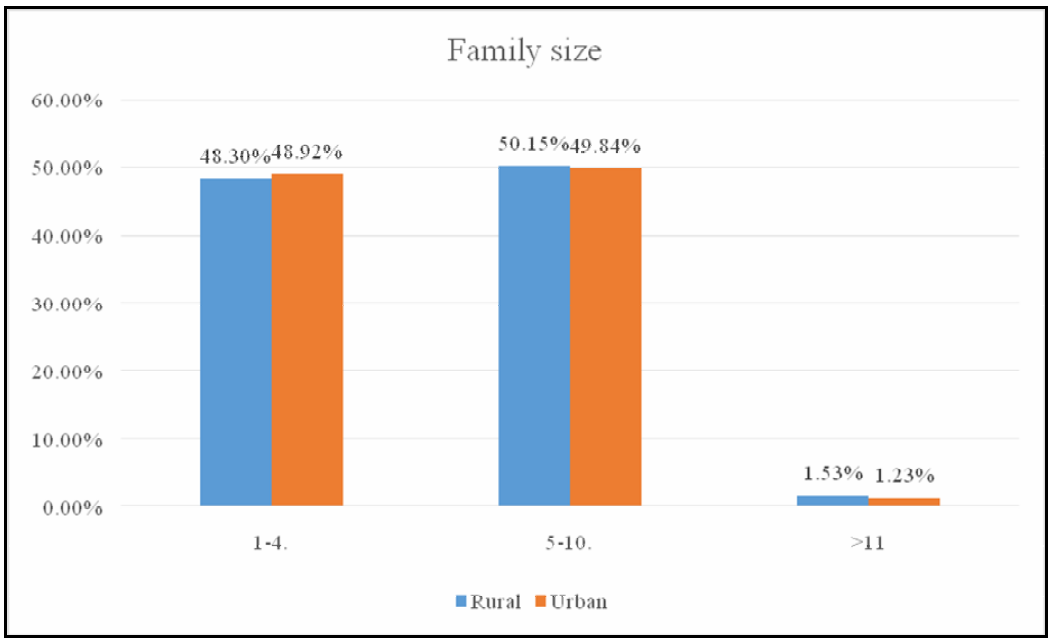


Figure 9: Bar diagram showing distribution of study subjects according to Family size

Table 10: Distribution of Study subjects according to number of siblings

Number of siblings	Rural	Urban	Total
0	23(7.07%)	26(8.00%)	49(7.5%)
1	83(25.53%)	142(43.69%)	225(34.6%)
2	145(44.61%)	121(37.23%)	266(40.9%)
3	61(18.76%)	34(10.46%)	95(14.6%)
4	13(4.00%)	2(0.61%)	15(2.3%)
Total	325	325	650

Most of the study subjects (40.9%) were found to have 2 siblings. Most of the children in urban area (43.69%) had one sibling and in rural areas (44.61%) had two siblings.

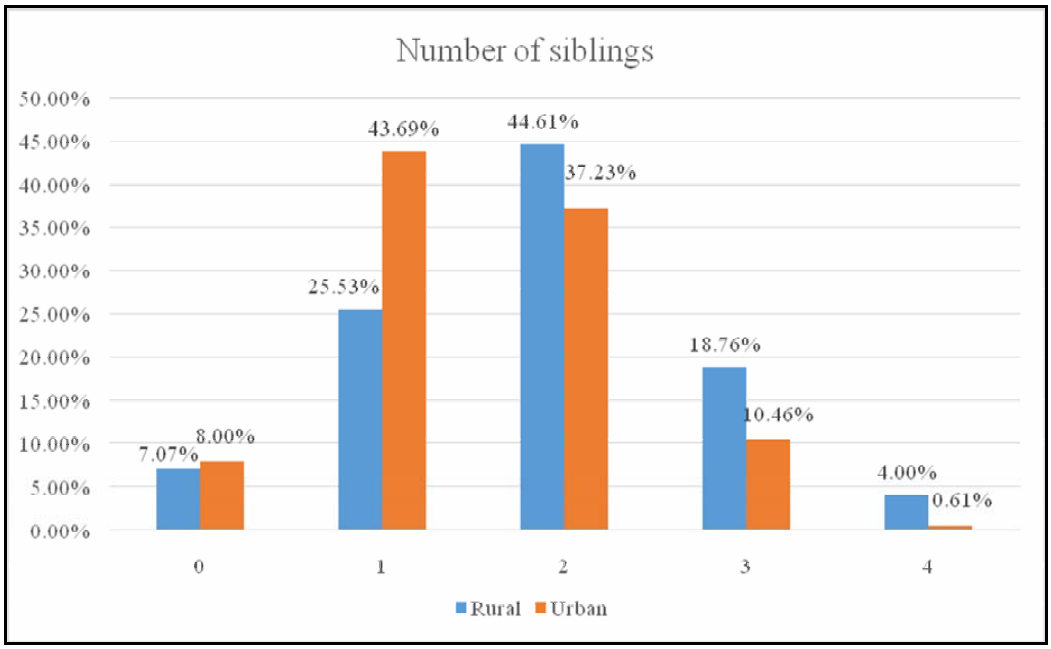


Figure 10: Bar diagram showing distribution of study subjects according to number of siblings

Table 11: Distribution of Study subjects according to scholastic performance in previous class

Grade in previous class	Rural	Urban	Total
A grade	130(40.00%)	176(54.15%)	306(47.1%)
B grade	131(40.30%)	112(34.46%)	243(37.4%)
C grade	64(19.69%)	37(11.38%)	101(15.5%)
Total	325	325	650

The overall scholastic performance among the children, showed that most of them (47.1%) secured Grade A in the assessments conducted by their respective schools. The scholastic performance was better in urban school children (54.15%) when compared with the rural school children (40%).

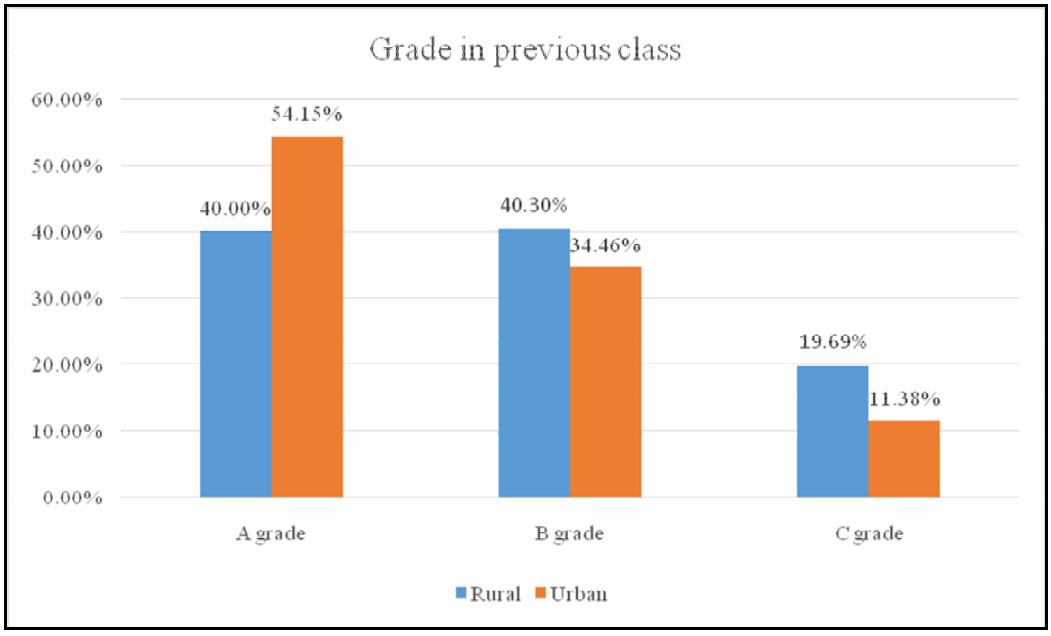


Figure 11: Bar diagram showing distribution of study subjects according to scholastic performance in previous class

Table 12: Distribution of Study subjects according to type of cooking salt used

Type of cooking salt used	Rural	Urban	Total
Packaged crushed salt	6(1.84%)	13(4.00%)	19(2.9%)
Packaged crystal salt	314(96.61%)	312(96.00%)	626(96.3%)
Loose crystal salt	5(1.53%)	0(0.0%)	5(0.8%)
Total	325	325	650

Most of study subjects (96.3%) reported to be using packaged crystal salt. Similar distribution observed when analysed according to the residence of children.

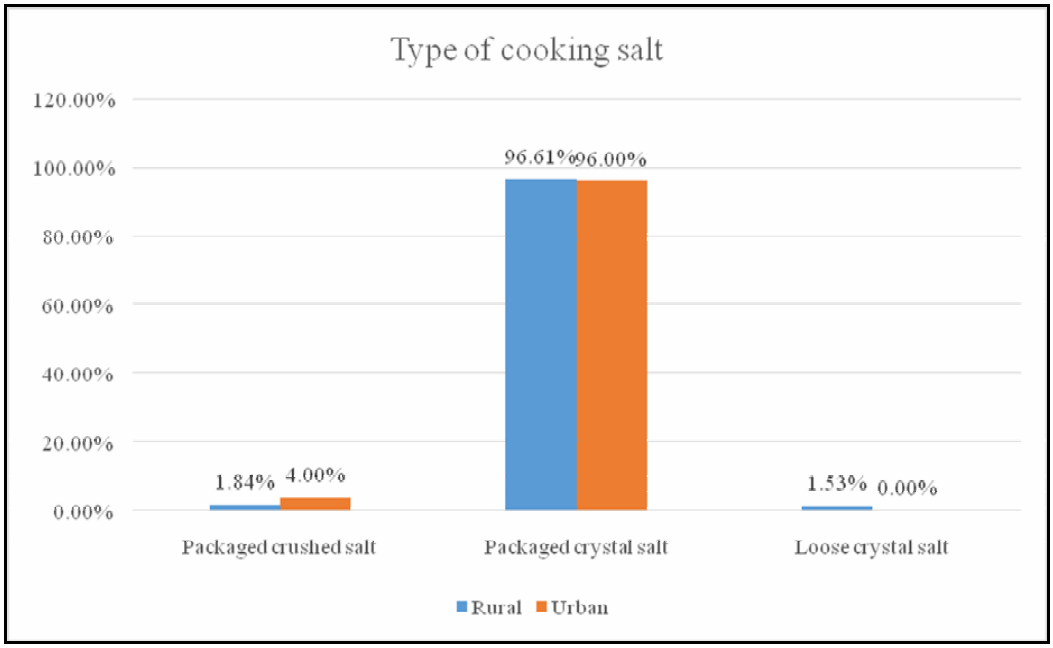


Figure 12: Bar diagram showing distribution of study subjects according to type of cooking salt used

Table 13: Distribution of Study subjects according to knowledge of iodised salt

Knowledge on iodised salt	Rural	Urban	Total
Yes	6(1.84%)	0(0.0%)	6(0.9%)
No	319(98.15%)	325(100%)	644(99.1%)
Total	325	325	650

The overall knowledge regarding iodised salt was found to be very poor (0.9%). Only 1.84% of the children in rural and none of the urban children had knowledge regarding iodised salt.

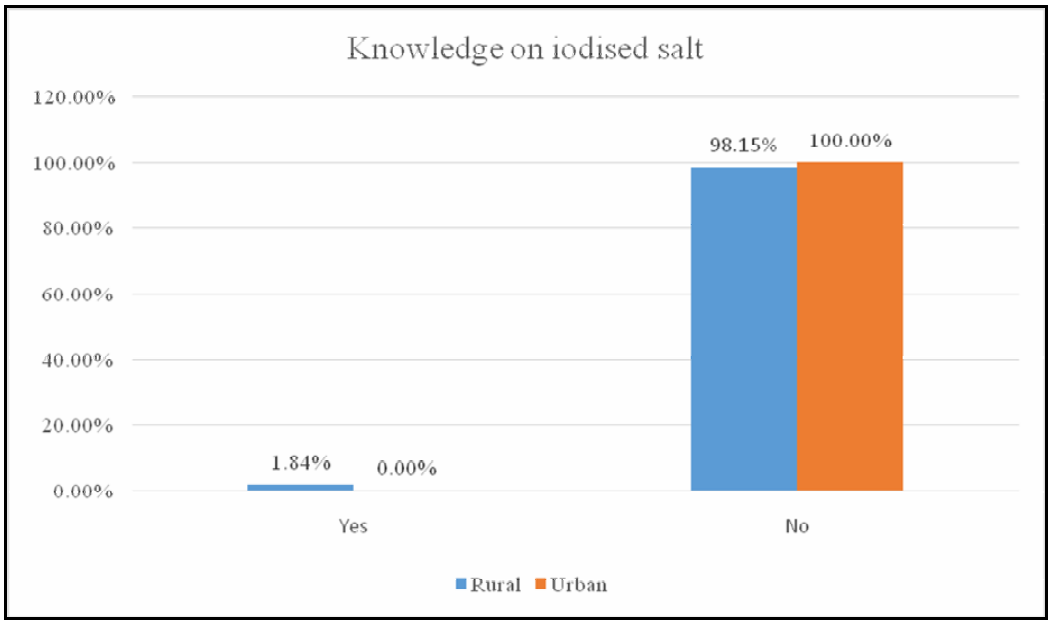


Figure 13: Bar diagram showing distribution of study subjects according to knowledge on iodised salt

Table 14: Distribution of Study subjects according to grade of goitre

Grade of goiter	Rural	Urban	Total
Grade 1	289 (88.92%)	301(92.61%)	607(93.4%)
Grade 2	26(8.00%)	5(1.53%)	31(4.8%)
Grade 3	10(3.07%)	2(0.61%)	12(1.8%)
Total	325	325	650

χ^2 =20.945, df =2, p =0.001

The overall prevalence of goiter among the school children aged 6-12 years was found to be 6.6%, in which 4.8% had Grade 2 goiter and 1.8% had Grade 3 goiter. The prevalence of goiter was found to be high in rural area (11.07%) when compared to urban area (2.15%).

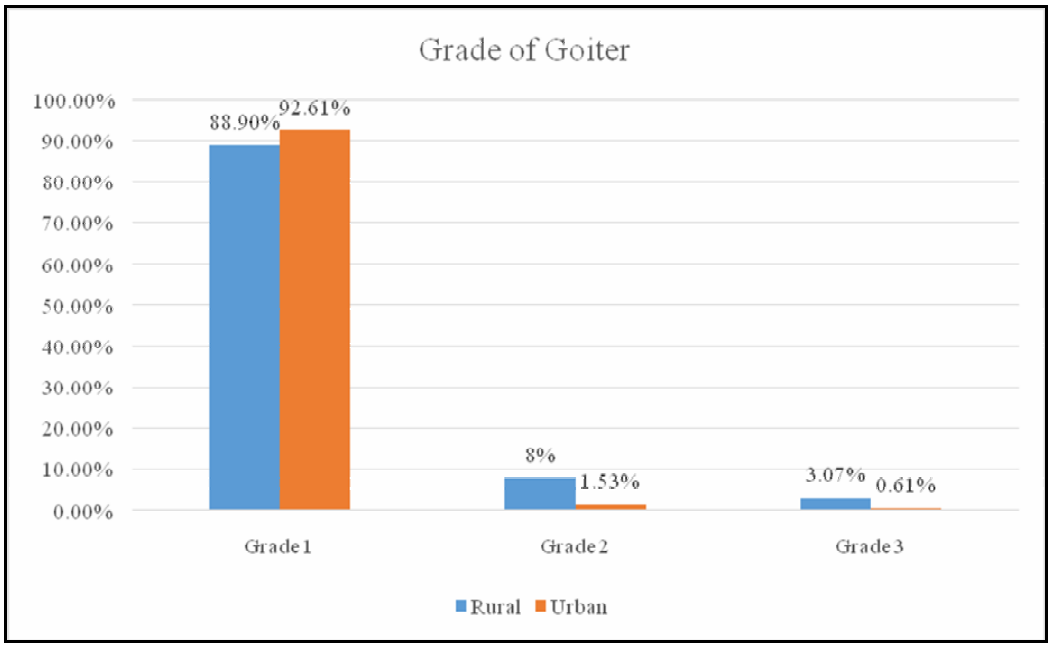


Figure 14: Bar diagram showing distribution of study subjects according to Grade of Goiter

Table 15: Age wise distribution of children according to Grades of goiter

Age	Grade 1	Grade 2&3	Total	P value
6-7yrs	200(32.94%)	2(4.65%)	202(31.07%)	0.001*
8-9yrs	195(32.12%)	6(13.95%)	201(30.92%)	
10-12yrs	212(34.92%)	35(81.39%)	247(38.00%)	
Total	607	43	650	

χ^2 =37.45, df =2, p =0.000

Among the 43 children having goiter, most of the children of 10-12 years were found to have goiter (81.39%), followed by 8-9 years (13.95%). There was increase in prevalence of goiter with increase in age, this was found to be statistically significant (p =0.001).

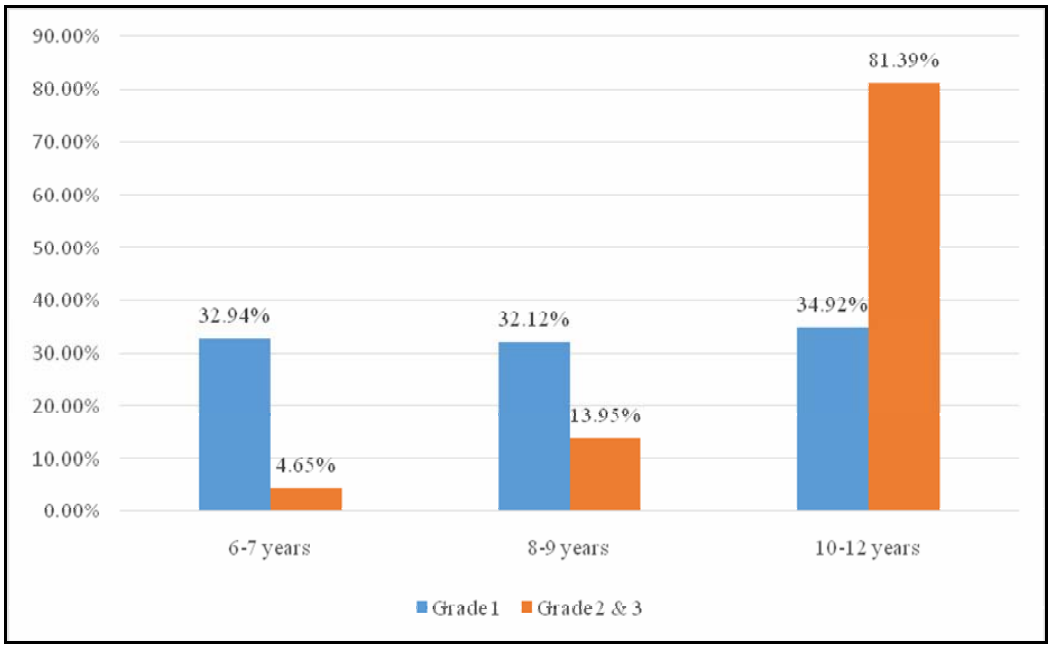


Figure 15: Bar diagram showing age wise distribution of Grade of Goiter

Table 16: Sex wise distribution of children according to Grades of goiter

Sex	Grade 1	Grade 2 & 3	Total	p-value
Male	324(53.37%)	14(32.55%)	338(52.00%)	
Female	282(46.45%)	29(67.44%)	312(48.00%)	**0.006**
Total	607	43	650	

χ^2 =7.032, df =1, p =0.006

The sex distribution of total prevalence of goiter showed that female children had a higher prevalence of goiter (67.44%) when compared to males (32.55%). Therefore the prevalence of goiter was found to be higher among female children than males and this difference was found to be statistically significant (p=0.006).

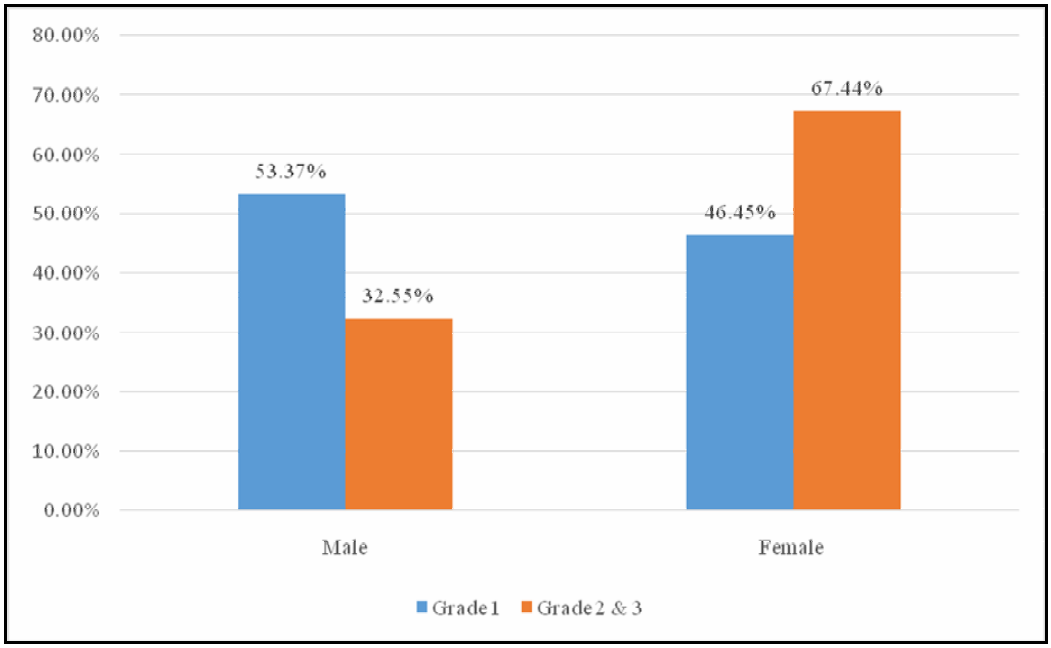


Figure 16: Bar diagram showing sex wise distribution of Grade of Goiter

Table 17: Religion wise distribution of children according to Grades of goiter

Religion	Grade 1	Grade 2&3	Total	P value (F exact)
Hindu	513(84.51%)	39(90.69%)	552(84.92%)	0.419
Muslim	93(15.32%)	4(9.30%)	97(14.92%)	
Christian	1(0.16%)	0(0.0%)	1(0.15%)	
Total	607	43	650	

χ^2 =1.226, df =2, p =0.419

The prevalence of goiter was found to be higher among Hindus (90.69%) than the other religions i.e. 9.30% among Muslims and 0.0% among Christians. This finding was not statistically significant (p =0.419).

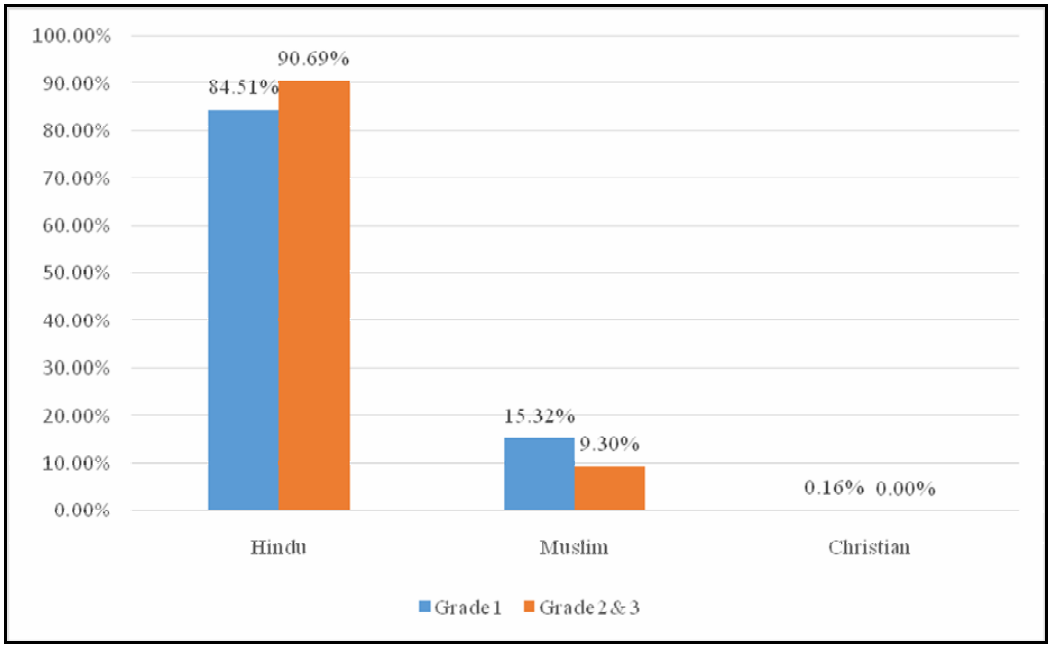


Figure 17: Bar diagram showing religion wise distribution of Grade of Goiter

Table 18: Social category wise distribution of children according to Grades of goiter

Caste	Grade 1	Grade 2&3	Total	P value (F exact)
General	87(14.33%)	4(9.30%)	91(14.00%)	0.034
SC	150(24.71%)	5(11.62%)	155(23.84%)	
ST	78(12.85%)	11(25.58%)	89(13.69%)	
OBC	292(48.10%)	23(53.48%)	315(48.46%)	
Total	607	43	650	

χ^2 =8.602, df =3, p=0.034

The social category wise distribution of total goiter rate was high in OBC (53.48%) followed by SC/ST, 11.62% and 25.58% respectively, which was higher when compared to the children belonging to general category. This difference was statistically significant (p=0.034).

Table 19: Economic status wise distribution of children according to Grades of goiter

BPL/APL	Grade 1	Grade 2&3	Total	p-value
BPL	363(59.80%)	38(88.37%)	401(61.69%)	**0.001***
APL	244(40.19%)	5(11.62%)	249(38.30%)	
Total	607	43	650	

χ^2 =13.86, df =1, p=0.001

The goiter among the different economic class of students showed a higher prevalence among BPL card holders (88.37%) when compared to APL (11.62%). This difference in prevalence among BPL and APL card holders was found to be statistically significant (p=0.001).

Table 20: Distribution of grades of goiter according to Socio-economic status by Modified BG Prasad classification

SES	Grade 1	Grade 2 & 3	Total	p-value
High	80(13.17%)	1(2.32%)	81(12.46%)	
Upper middle	164(27.01%)	4(9.30%)	168(25.84%)	
Lower middle	168(27.67%)	21(48.83%)	189(29.07%)	**0.001***
Lower	195(32.12%)	17((39.53%)	212(32.61%)	
Total	607	43	650(100%)	

χ^2 =15.53, df =3, p=0.001

Among the children belonging to different socio-economic groups, the total goiter rate was highest among low socio-economic status group (39.53% in lower and 48.83% in lower middle) than those belonging to high socio-economic group (2.32%). This difference in prevalence of goiter was found to be statistically significant (p=0.001).

Table 21: Distribution of Grades of goiter according to Birth order of study

Birth order	Grade 1	Grade 2 & 3	Total	P value (F exact)
1	227(37.39%)	10(23.25%)	237(36.46%)	
2	319(52.55%)	24(55.81%)	343(52.76%)	
3	46(7.57%)	5(11.62%)	51(7.84%)	**0.026**
4	15(2.47%)	4(9.30%)	19(2.92%)	
Total	607	43	650	

χ^2 =9.53, df =3, p=0.026

The distribution of total goiter according to birth order showed a higher prevalence among children of birth order 2 (55.81%). This difference in the overall prevalence of goiter with birth order was found to be statistically significant (p=0.026).

Table 22: Distribution of grades of goiter according to type of family

Type of family	Grade 1	Grade 2 & 3	Total	P value (F exact)
Nuclear	448(73.80%)	31(72.09%)	479(73.69%)	**0.962**
Joint	45(7.41%)	3(6.97%)	48(7.38%)	
Three generation	114(18.78%)	9(20.93%)	123(18.92%)	
Total	607	43	650	

χ^2 =0.124, df =2, p=0.962

The goiter was found to be highest among those children who belonged to nuclear family (72.09%) and least among the children belonging to joint family (6.97%).This variation in prevalence of goiter among different types of family was not found to be statistically significant (p=0.962).

Table 23: Distribution of grades of goiter according to family size

Family size	Grade 1	Grade 2&3	Total	P value
1-4	301(49.58%)	15(2.47%)	316(48.61%)	**0.186**
5-10	298(49.09%)	27(62.79%)	325(50.00%)	
>11	8(1.31%)	1(2.32%)	9(1.38%)	
Total	607	43	650	

χ^2 =3.587, df =2, p=0.186

The prevalence of goiter according to the family size showed that, the prevalence was highest among children belonging to families with 5-10 members (62.79%).This difference in the prevalence of goiter according to family size was not found to be statistically significant(p=0.186).

Table 24: Distribution of grades of goiter according to number of siblings

Number of siblings	Grade 1	Grade 2 & 3	Total	P value
0	45(7.41%)	4(9.30%)	49(7.53%)	**0.001**
1	209(34.43%)	16(37.20%)	225(34.61%)	
2	252(41.51%)	14(32.55%)	266(40.92%)	
3	89(14.66%)	6(13.95%)	95(14.61%)	
4	12(1.97%)	3(6.97%)	15(2.30%)	
Total	607	43	650	

χ^2 =5.43, df =4, p=0.001

The distribution of prevalence of goiter according to number of siblings showed a higher prevalence among children with one sibling (37.2%) and least among those with 4 siblings (6.97%). This difference of total goiter rate with the number of siblings of study subjects was found to be statistically significant (p=0.001).

Table 25: Distribution of grades of goiter according to grades in previous class

Grade in previous class	Grade 1	Grade 2&3	Total	P value
A grade	294(48.43%)	12(27.90%)	306(47.07%)	0.186
B grade	228(37.56%)	15(34.88%)	243(37.38%)	
C grade	85(14.00%)	16(37.20%)	101(15.53%)	
Total	607	43	650	

χ^2 =3.58, df =2 1,p=0.186

The prevalence of goiter was found to be 37.2% among children with Grade C, whereas among those who had secured A grade in their previous exams had a prevalence of 27.9%.This difference was not found to be statistically significant (p=0.186).

Table 26: Distribution of grades of goiter according to type of salt

Type of salt	Grade 1	Grade 2 & 3	Total	P value (F exact)
Packaged crushed salt	19(3.13%)	0(0.0%)	19(2.92%)	**0.738**
Packaged crystal salt	583(96.04%)	43(100%)	626(96.30%)	
Loose crystal salt	5(0.82%)	0(0.0%)	5(0.760%)	
Total	607	43	650	

χ^2 =1.76, df =2, p=0.738

All the 43 children who had goiter were consuming packaged crystal salt (iodised). However, this finding was not found to be statistically significant (p=0.738).

Table 27: Distribution of grades of goiter according to knowledge on iodised salt

Knowledge of iodised salt	Grade 1	Grade 2 & 3	Total	P value (F exact)
Yes	6(0.98%)	0(0.0%)	6(0.92%)	0.662
No	601(99.01%)	43(100%)	644(99.07%)	
Total	607	43	650	

χ^2 =0.429, df = 1, p=0.662

All the 43 children who had goiter did not have the knowledge regarding iodised salt. However, this finding was not found to be statistically significant (p=0.662).

Table 28: Mean urine iodine level among the study subjects

	No.	Minimum	Maximum	Mean	Median	SD
Urine Iodine	150µg	40 µg	214 µg	128.83 µg	135 µg/L	35.447

The median urine iodine excretion among children was found to be 135 µg/L.

Table 29: Distribution of urine iodine excretion levels among the study subjects

Urine iodine excretion	Frequency	Percentage
Inadequate	18	12
Adequate	132	88
Total	150	100

Among the 150 urine samples tested for iodine levels in urine, only 12% of the children were found to have inadequate urine iodine excretion, whereas 88% of the children had adequate urine iodine excretion.

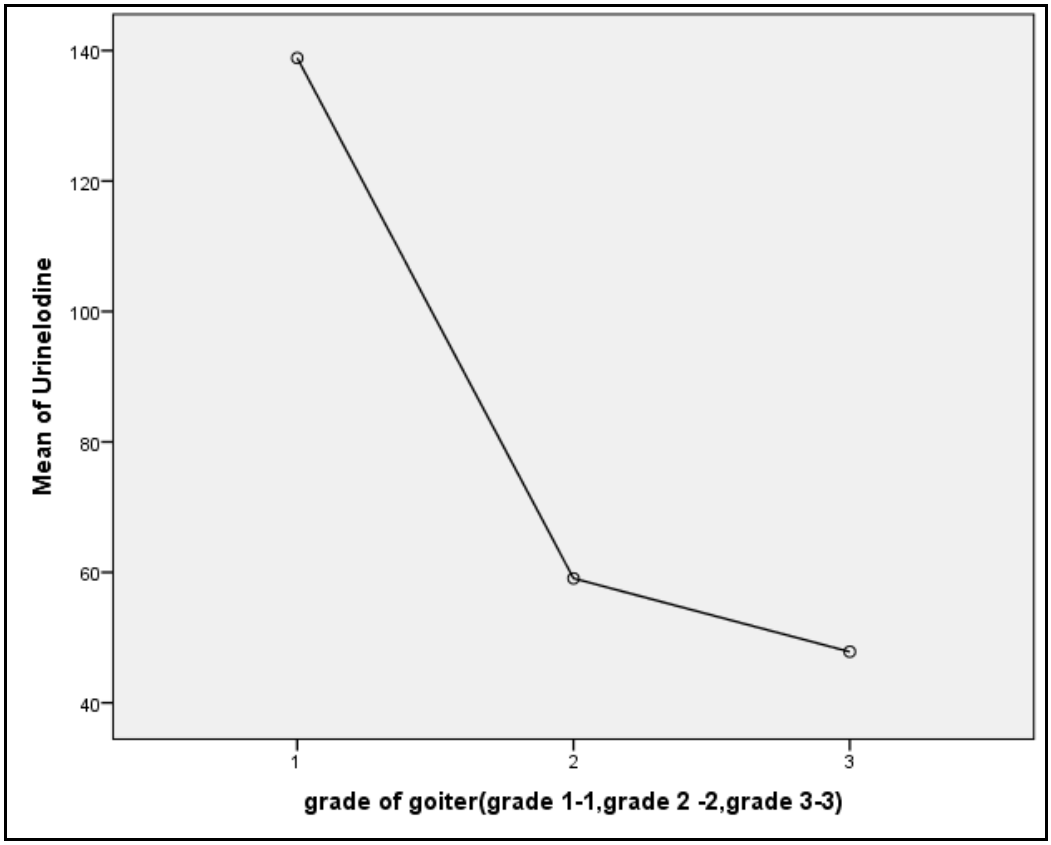


Figure 18: Mean plot for urine iodine versus grades of goiter

The mean iodine levels decreased with increase goiter grades, there was drastic reduction in grade 2 and 3 when compared with normal children.

Table 30: Distribution of Urine iodine level of the study subjects according to residence (t-test)

Residence	N	Mean	SD	P value
Rural	77	2.17	0.625	0.279
Urban	73	2.82	0.586	

The mean urine iodine excretion was marginally lower among rural children (2.17) compared to the urban counterparts (2.82) however this difference was found to be not statistically significant. (p=0.279)

Table 31: Distribution of Urine iodine level of the study subjects according to grades of goiter (ANOVA)

Grades of goiter	N	Mean	SD	SE	95% confidence interval		P value
					Lower bound	Upper bound	
Grade 1	132	138.86	23.950	2.085	134.73	142.98	**0.001**
Grade 2	12	59.08	9.307	2.687	53.17	65	
Grade 3	6	47.83	4.75	1.939	42.85	52.82	
Total	150	128.83	35.447	2.894	123.11	134.55	

The mean urine iodine excretion level significantly varied between normal subjects and grade 2 and 3 subjects. The difference in means of the urine iodine excretion level among different grades of goiter was found to be statistically significant (p=0.001).

Table 32: Post hoc test for Urine iodine level of study subjects and grades of goiter

Grades of goiter	Comparison	Mean difference	Standard Error	P value	95% CI	
					Lower bound	Upper bound
1	2	79.773	6.865	0.001	63.15	96.40
	3	91.023	9.504	0.001	68.01	114.04
2	3	11.250	11.384	0.974	-16.32	38.82

The mean UIE levels among grade 2 was found to be significantly lower when compared to normal subjects, similar findings was also observed between grade 3 and normal subjects. However UIE levels between grade 2 and 3 goiter was not found to be statistically significant.

Table 33: Distribution of urine iodine level according to salt iodine

Urine iodine	Salt iodine		Total	P value (F exact)
	Inadequate Iodine	Adequate Iodine		
Moderate	9(56.2%)	0(0.0%)	9(6%)	0.001
Mild	7(43.8%)	2(1.5%)	9(6%)	
Adequate	0(0.0%)	132(98.5%)	132(88%)	
Total	16	134	150	

The children with mild and moderate UIE were found to have inadequate salt iodine (56.2% and 43.8% respectively) consumption pattern when compared those consuming adequate iodine .This difference was found to be statistically significant. (p=0.001)

DISCUSSION

The present study was conducted 24 years after the implementation of universal iodization of edible salt. This study was conducted to find the current status of goiter prevalence in Kolar taluk among school children aged 6-12 years.

6.1 Prevalence of goitre

The total prevalence of goitre (i.e. the palpable and visible goiter) in the present study was found to be 6.6%. According to the WHO criteria for severity of goitre, this rate of goitre prevalence falls under the category of being a mild public health problem as it falls in the range of 5.0-19.9%. Hence the goal of NIDDCP to reduce prevalence of IDD <10% by 2012 has been achieved.[2]It also indicates that Kolar is in a transition phase from iodine deficient to being iodine sufficient. This finding can be taken into consideration to sustain, monitor and intensify IEC activities to eliminate IDD in near future. As per the status report by NIDDCP in 2002, the prevalence in entire Kolar district was found to be 2.53% with a total number of 61 goiter cases in the district.[88]

There is a wide variation of prevalence of goiter across the country, as observed in various studies ranging from 0.125% to 50.1%.[89,90] Severe endemicity of goiter was reported by Joshi DC et al in a rural area of Meerut with an overall prevalence of goiter of 50.1%, and Sayed NA et al (34.6%).Persistence of severe goiter was attributed to environmental iodine deficiency and also diets high in certain foods which interfere with iodine utilization by the body.[90,91]

Whereas a study by Sridhar PV et al observed in Bellur Hobli was non-endemic to goiter (TGR=0.125%) and by Kapil U et al in Pondicherry with a TGR of

2.6%. It indicates that by achieving the universal iodisation of salt, IDD can be successfully eliminated from the community.[89,92]

Kapil U reported IDD to be of mild degree in Bharatpur, Rajasthan and Champaran district, Bihar with an overall goiter prevalence of 7.2% and 11.6% respectively.[73,93]Similar findings were made by Sareen N et al in Uttarakhand (TGR=13.2%)and by Lohiya A et al in Faridabad, Haryana(TGR=17%).[94,95]

Pandav CS et al found that IDD still continues to be an important public health problem in Delhi, with a moderate degree of goiter prevalence (TGR= 20.5%).[49] A similar observation was made by Manjunath B et al in a rural area of Karnataka in South India, with a TGR of 21.9%, which was found to be associated with consumption of low iodized salt.[96]

This wide variation could be due to geographical disparity in the country with respect to the environmental factors influencing the prevalence of goiter[97]. This could also be due to variation in the methodology adopted in terms of sample size and age groups included in various studies.[101]

It is wrongly believed that populations residing in areas which are not situated in high altitude do not suffer from iodine deficiency disorders as they consume water and food rich in iodine, but there are various factors influencing IDD in these areas. Various studies suggest that the reason for persistence of goitre despite adequate salt iodization might be other goitrogens or deficiency of other micronutrients. Notable among these are iron[98] and selenium[99]deficiency, and the consumption of goitrogenic food which has thiocyanate. Autoimmune thyroid disorders are also an important cause of goitre in the post-iodization phase in India.[100] Hess et al have shown that supplementing iron in iron-deficient children with goitre decreases its size.[101]

6.2 Grades of Goitre

The present study showed that among the Grades of goiter, Grade 2 (4.8%) was found to be more prevalent than grade 3 (1.8%). Chandra AK et al, also observed in Imphal, Manipur and Sundarban delta of West Bengal, that most of the goitre was found to be Grade 2 (24.73% and 30.4% respectively) and the prevalence of Grade 3 was only 5.29% and 2.7% respectively.[50,42] Similarly other studies in Churachanpur District of Manipur by Singh LH et al and Kulgam district of Jammu and Kashmir by Khan SMS et al, the prevalence of Grade 2 goiter was found to be higher than Grade 3 goiter.[51,52]

6.3 Age and Prevalence of goitre

The prevalence of goitre was found to increase with age in the present study, with highest prevalence among 10-12 years age group (81.39%). This was similar to the observations made by Chaudhary C et alin Ambala district of Haryana, the goiter rate was higher(1.7%) in 9 to 12 years age group as compared to 6 to 8 years (1.45%).[54] Similar observations of increase in the goiter prevalence with age was observed in other studies by Makwana NR et al in Jamnagar and by Amin D et al in Amreli, Gujarat with a highest prevalence among 11-12 years of age.[53,57]

Biswas AB et al in Birbhum, West-Bengal found that the prevalence was found to increase with age except for children aged 10yrs (12.9%), with a goiter rate of 11.9% and 13% among 8 and 9 year old children respectively.[56] Das S et al had reported higher prevalence among adolescents (13 to 16 years) as compared to young children (6 to 12 years).This increase in prevalence of goiter with age can be explained due to the influence of hormonal alterations during peri-pubertal period on thyroid gland.[77]

Rawal SV et al in Gandhinagar district observed high prevalence of goiter in the age group 8-9 years (9.4%).[55] Whereas, another study in Kashmir, by Rafiq M et al observed that the rate of goiter was found to be more among 12years age group (9.75%) followed by 7.57% among 11yrs age group.[47] Chandwani HR et al, in Bharuch, Gujarat, observed that the prevalence was more among 6yrs old children (24%) than among 12 years (20.7%) and was highest in nine year olds (29.2%).[58]

6.4 Sex and Prevalence of goiter

The prevalence of goiter is found to be higher among female children (9.2%) than males (4.1%) in the current study. Study by Yadav S et al, in Northern India observed a higher prevalence of goitre among females (29.4%) when compared to males (32.8%).[59] Other studies in Bahrain by Moosa K et al (16.5% vs 15.8%) and in Chamarajnagar district by Zama SY et al (8.58% vs 6.88%) made similar observations of a greater prevalence of goiter among female children than males.[60,61] This probably is related to the difference in sex hormones and pubertal growth pattern among boys and girls in higher age groups.[102,103]

6.5 Religion and prevalence of goiter

The present study showed that prevalence of goiter was 7.06% among Hindus and 4.1% among Muslims which was not statistically significant. Sen TK et al, in West Bengal, reported that the TGR did not differ significantly between Hindu (21.5%) and Muslim (17.5%).[63] Similarly, DK Das et al in Dinajpur district of West Bengal and in the Howrah district of West Bengal observed that there was no significant difference in TGR between Hindus and Muslims (18.9% versus 17.6%).[64,62]

6.6 Place of Residence:

In the present study rural children were found to have a higher prevalence of goiter (11.07%) when compared to urban children(2.15%). Sen S et al in Bardhaman district, West-Bengal also observed that the total goiter rate in children belonging to rural areas was (37.1%), significantly higher than those from urban areas(29.4%).[65] However Sen TK et al in another study reported that there was no significant difference of the TGR by zone of residence (22% in rural area versus 17% in urban area).[62]

6.7 Caste and goiter

The total goiter rate in the present study was found to be high among OBC (53.48%) followed by scheduled caste and scheduled tribes (11.62% and 25.58% respectively) and least in general category (9.30%).Whereas Joshi DC et al reported that in rural area of Meerut with a higher TGR among the Scheduled caste members (53.6%) when compared to the General category members (29.8%).[90] A similar finding was observed in a study by PGS Sethy et al in urban slums of Bhubaneshwar.[74]

6.8 Socio-economic status and goiter

In the present study it was found that the prevalence of goiter was high among low socio-economic status (48.83% in lower middle and 39.53% in lower class) than those children belonging to high socio-economic status (2.32%). Similar observations were made by Joshi DC et al in a rural area of Meerut with highest percentage of goiter cases among children of low SES (TGR=56.4%) followed by those with high SES (TGR=37.0%),and also by Panigrahiet al in Cuttack, Orissa and Singh MB et al in Jodhpur,Rajasthan.[39,90,66,67]

6.9 Type of salt

In the present study it was found that majority (96.3%) of the household use packaged crystal salt when compared to packaged powdered salt (2.9%) and loose crystal salt(0.8%). Similarly, Kibatu G et al in Metekel zone of Ethiopia observed that 72% used coarse salt and 28% of the households used fine salt.[70] Whereas, Raveesh PM et al in Gulbarga, observed that 21.02% were unpacked crystal salts, 61.02% samples were powdered packed salt and 17.94% samples were packed crystal salt.[69] Similarly Khatiwada S et al observed in Nepal, that majority (85%) used iodised powdered salt and 15% used crystal salt.[68]

6.10 Urine iodine

The median urine iodine in the present study was found to be135 µg/L, 12% of them had inadequate UIE, whereas 88% of the children had adequate urine iodine excretion which was similar to recent study by Kapil U et that 86% of the districts in India had adequate UIE (100µg/L).[104]Similarly in Sundarbans, West-Bengal, it was found that median urinary iodine level was 225 mg/l, 76.7% of the children had adequate UIE whereas 23.3% had UIE below 100mcg/L.[66] Whereas PB Jagirdar et al in Kolhapur district of Maharashtra, observed that only 19.8% of the samples had adequate UIE whereas 80.2% samples had inadequate UIE.[42]

According to WHO database, 2007 the median urine iodine excretion in Kolar district was found to be 95µg/dl, and prevalence of urine iodine excretion <100 µg was 56.4%, whereas MUI excretion in Bangalore rural and urban is 100 and 185 µg respectively among 11-18years age group.[105,106]

Kapil U et al in Bharatpur district of Rajasthan, reported that the median Urinary iodine excretion was 200.0 mcg/L. 90% of the children had UIE >100mcg/L indicating adequate iodine intake.[71]Similarly other studies by Kapil U et al in

Andaman district, and by Dodd NS et al in Bombay, was observed that 90.9% and 88% of children had UIE >100 mcg/L respectively.[72,73]

Whereas Sethy PGS et al reported that in urban slums of Bhubaneswar, the median urinary iodine concentration was only 50µg/L.[76]Similarly in Bharuch district of Gujaratand Nainital 56.4% and 38.3% of the children had UIE >100mcg/L.The other factors which influence UIE are drinking water iodine content and urine thiocyanate which show a positive correlation with the UIE levels.[58,75]

6.11 Salt iodine

The salt iodine content was found to be adequate (>15ppm) in 88% of the samples even though only 0.9% children had knowledge regarding iodised salt, indicating a transition phase from iodine deficient to sufficient phase. The 12% of the samples which had inadequate iodine content can be explained due to improper methods of storing the iodised salt at the household level.

Das et al in Chandigarh observed that majority (98.1%) of the samples had adequate iodine content (>15ppm).[66] Similarly in Kangra, Himachal Pradesh Kapil U observed that majority (82.3%) of the families were consuming adequately iodised salt.[67]

Whereas in the basin of the river Ganga and the Bay of Bengal in the Howrah and Purba districts showed that 66.4% of households were consuming salt with adequate iodine.[70]

Whereas Banumathi PG and Panigrahi et al observed that only 40.2% and 60.1% of the salt samples had adequate iodine respectively.[27,69] Other studies in Coastal Karnataka and Purulia also observed that majority of the salt samples was inadequately iodised (48.3% and 33.3% respectively).[43,55]

In Jodhpur, Rajasthan, it was observed that majority of children consumed inadequately iodized salt which indicates that the consumption of iodized salt in desert area is extremely low in spite of the national programs in operation.[56]

SUMMARY

A cross sectional study was carried out to estimate prevalence of goitre, median urine iodine excretion and salt iodine content among school children aged 6-12 years in Kolar taluk. The overall prevalence of goiter was found to be 6.6%, in which 4.8% had Grade 2 goiter and 1.8% had Grade 3 goiter. There is a significant increase in prevalence of goiter with increase in age, with highest prevalence among 10-12 years old children (38%).The prevalence was found to be higher in females than males. The prevalence was high in OBC (53.48%) followed by SC/ST. The goiter among the different economic class of students showed a higher prevalence among BPL card holders (88.37%) when compared to APL. Children with birth order 2 were found to have a higher prevalence than others. Most of study subjects (96.3%) reported to be using packaged crystal salt and only 0.9% children had knowledge regarding iodised salt. The median urine iodine excretion was found to be 135 μg/L. The salt iodine content was found to be adequate (>15ppm) in 88% of the samples, indicating a transition phase from iodine deficient to sufficient phase. The 12% of the samples which had inadequate iodine content can be explained due to improper methods of storing the iodised salt at the household level.

CONCLUSIONS

The study concludes that goiter continues to be prevalent in mild endemic proportions (6.6%) in Kolar taluk, this calls for identification of factors leading to goiter despite effective implementation of universal salt iodisation. It can be considered that it is in a transition phase from iodine deficient to iodine sufficiency. However, it continues to be an important public health problem and it is essential to monitor the iodine content of salt on a regular basis. IDD control activities should be strengthened and surveys should be done every 3-5 years to monitor the progress in eliminating IDD. Therefore, sustainment of and proper monitoring of the universal salt iodisation program can lead to elimination of IDD in the area, in near future.

RECOMMENDATIONS

Goitre still remains as an important public health problem in Kolar taluk. There is a need to strengthen the National Iodine Deficiency Disorder Control Program. In this regard, the following recommendations can be considered:

- In order to find the exact magnitude of the problem in whole Kolar district, the survey needs to be done in other taluks also. Survey should be conducted once in every 3 to 5 years to sustain the efforts toward the elimination of IDD as a public health problem.
- Strengthening the Information, Education and Communication activities (IEC), especially for the school children so that they are made aware about the consumption of iodized salt.
- Sustained efforts are required to attain the goal of achieving consumption of adequately iodized salt. Behaviour change communication (BCC), to store the iodised salt in closed containers and not in open vessels and plastic jarsto prevent loss of iodine at the household level.
- A Goitre cell needs to be established at district level with expertise from medical colleges.

LIMITATIONS OF THE STUDY

This cross sectional study conducted on school going children to study the prevalence of Iodine deficiency disorders. The prevalence of IDD with respect to age, sex, social status, residence and other socio-demographic factors were studied but the environmental factors influencing IDD were not studied.

The Study recommends in depth study to explore the environmental and other factors influencing the occurrence of IDD.

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ANNEXURE – I

PROFORMA

TITLE: "A STUDY OF PREVALENCE OF GOITRE AMONG SCHOOL CHILDREN IN KOLAR"

SECTION A: SOCIO-DEMOGRAPHIC PROFILE

1) NAME:

2) AGE:

3) GENDER: a)MALE b)FEMALE

4) CLASS/STANDARD: a) I b) II c) III d) IV e) V f) VI g) VII

5) RELIGION: a)HINDU b)MUSLIM c)CHRISTIAN d)OTHERS

6) CASTE: a)GENERAL b)SC/ST c)OBC d)OTHERS

7) SCHOOL ADDRESS:

8) STUDENT ADDRESS:

9) BPL/APL CARD HOLDER:

10) TOTAL INCOME:

11) PER CAPITA INCOME:

Modified BG Prasad Classification	I. Upper High	
	II. High	
	III. Upper Middle	
	IV. Lower Middle	
	V. Lower	

12) WHAT IS YOUR BIRTH ORDER? 1]1 2]2 3]3 4]4

13) NUMBER OF SIBLINGS IN YOUR FAMILY? 1]0 2]1 3]2 4]3 5]4 6]>4

14) WHAT IS THE TYPE OF FAMILY? 1] NUCLEAR 2] JOINT 3] THREE GENERATION

15) TYPE OF COOKING SALT PURCHASED FOR YOUR HOUSEHOLD: a) Packaged crushed salt b)Packaged crystal salt c) Loose crystal salt

16) HAVE YOU HEARD ABOUT IODISED SALT: a)YES b) NO

SECTION B: CLINICAL EXAMINATION:

EXAMINATION FOR GOITRE (as per the standard of WHO guideline for classification of goitre):

GRADE 1 No palpable/Visible Goitre	YES/NO	
GRADE 2 Palpable but not visible	YES/NO	
GRADE 3 Clearly visible	YES/NO	

SECTION C:

1) URINE IODINE:

2) SALT IODINE ESTIMATION:

0 ppm	No Iodine
<15 ppm	Inadequate
>15 ppm	Adequate

ANNEXURE – II

CONSENT FORM

I the parent/guardian of _____ agree for the participation in the 'Study of Prevalence of Goitre Among School Children in Kolar'. I agree for collection of all the information listed by you in the information sheet.

I have been explained about the study in the way I can understand it (both verbally and writing). The child has the liberty to quit the study anytime. I agree for the participation in the study on my own will.

Name and signature

Witness

1.

2.

ANNEXURE – III

INFORMATION SHEET

My name is Dr. Varsha R Mokhasi, Post Graduate in the department of Community Medicine, Sri Devaraj Urs Medical College, and Kolar. We are carrying out a study on prevalence of goitre among school in Kolar. The study has been reviewed by the local ethical review board and will be started only after their formal approval.

Iodine is an important micronutrient required for thyroid function and is also necessary for the normal growth and development, deficiency of which can have deleterious effect on the developing brain of the foetus, ranging from mild brain dysfunction to irreversible intellectual impairment.

Iodine deficiency is also known to cause endemic goitre. In this regard, I will the child some questions about him/her and the household. The child does not have to answer any question that he/she does not want to answer and may end this interview at any time he/she wants to. However, an honest answer to these questions will help us better understand the health status of this area. We would greatly appreciate your help in responding to this survey. The survey will take about half an hour to ask the questions.

Participation in this study doesn't involve any cost. This study is not only beneficial to the child but also to the community in large. The results gathered from this study will be beneficial in evaluating the services provided by the health care delivery system by the Government.

All the information collected from the child will be strictly confidential and will not be disclosed to any outsider unless compelled by law. This information

collected will be used only for research. The study involves collecting socio demographic information along with clinical examination, urine and salt iodine estimation. There is no compulsion to participate in this study. You required to sign only if you voluntarily agree for the child's participation in this study.

Further, he/she are at liberty to withdraw from the study at any time, if you wish to do so. Be assured that the withdrawal will not affect the treatment by the concerned physician in any way. It is up to you to decide whether to permit for participation. This document will be stored in the safe locker in the department of Community Medicine in the College and a copy is given to you for information.

For any further clarification you are free to contact the Principal investigator Dr. Varsha R Mokhasi; Mobile No: 9663696854.

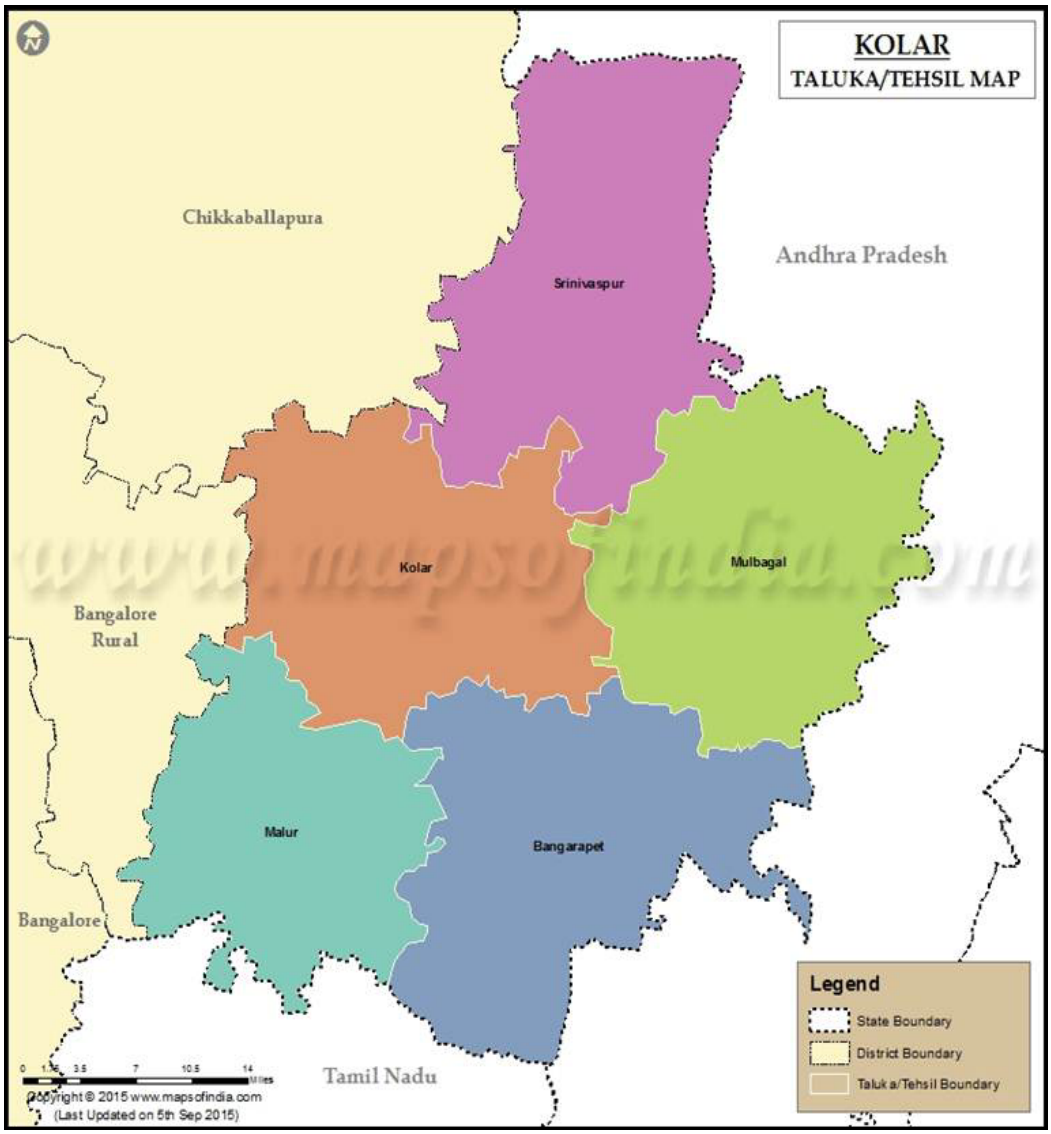
ANNEXURE – IV

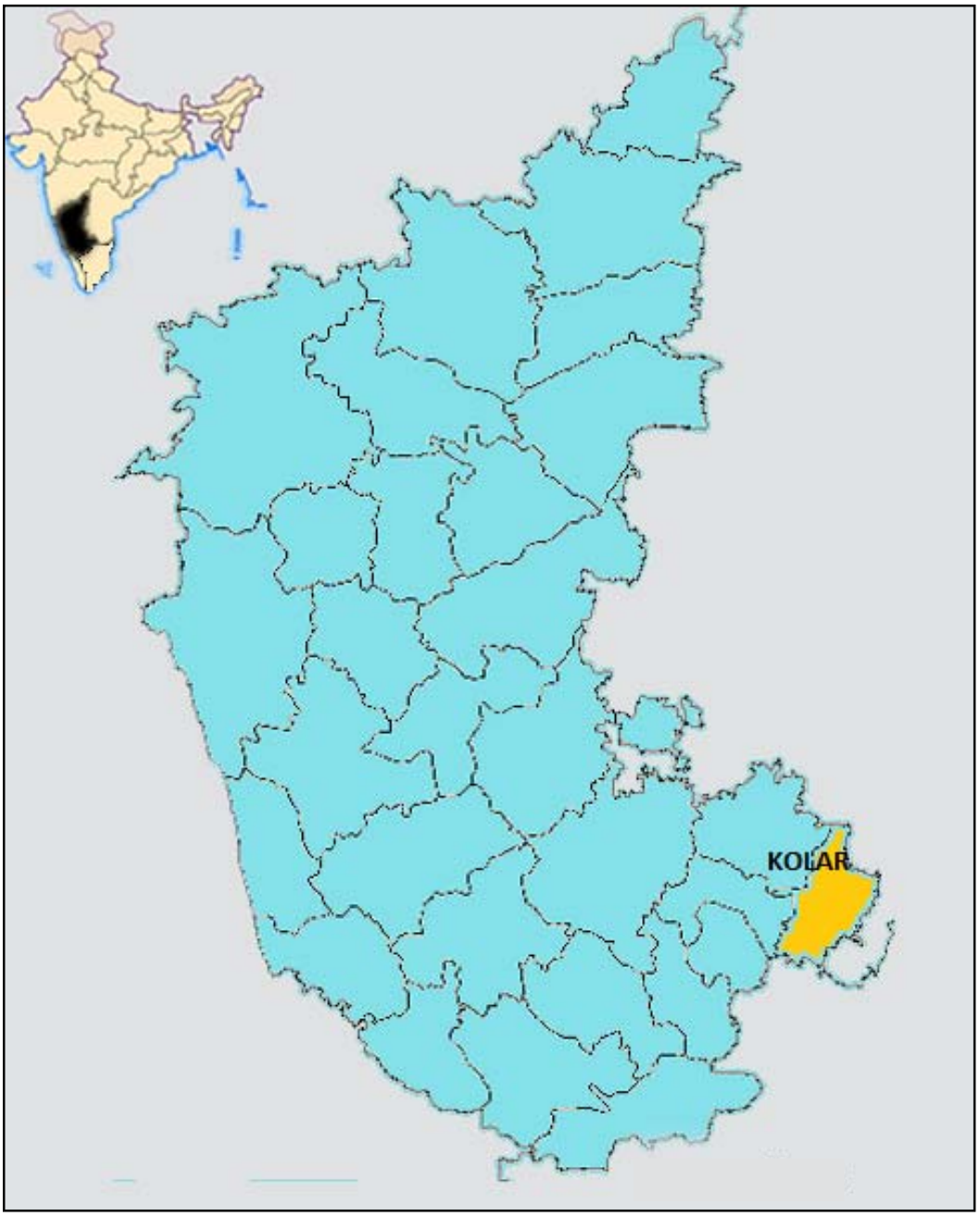
GANTT CHART

STEP	ACTIVITY	TIME PERIOD											
		2014			2015			2016					
		Aug to Nov	Nov	Dec	Jan	Feb to Mar	April to Dec	Jan to June	July to Aug	Aug to Sep	Sep to Oct	Nov	
1	Topic search and selection												
2	Synopsis submission												
3	Approval by IEC												
4	Proforma Preparation and validation												
5	Pilot project												
6	Review of literature												
7	Data collection												
8	Data analysis												
9	Dissertation writing												
10	Submission of dissertation												

ANNEXURE – V

MAP SHOWING KARNATAKA STATE AND KOLAR DISTRICT IN KARNATAKA




KOLAR

ANNEXURE – VI

LIST OF SCHOOLS SELECTED FOR THE STUDY

Sl. No.	Schools	Region (Urban/ Rural)	No of children included
1	Government Primary School, Tamaka	Urban	32
2	Mother Theresa School, Aralepet	Urban	32
3	BES Convent, Shaheensha Nagar	Urban	32
4	HKMS School, Shamshir Mohalla	Urban	32
5	Government Primary School, Idrisab Mohalla	Urban	32
6	Government Primary School, Vemgal	Rural	32
7	Shubhash High School	Urban	32
8	Government Primary School, Gulpet	Rural	33
9	Government Primary School, Old Kolar	Urban	32
10	Government Primary School, Keelukote	Rural	33
11	Morarji Desai Residential School, P. Halli	Rural	32
12	Government Primary School, Narasapura	Rural	33
13	Guptha's International School	Urban	32
14	Government Primary School, Thamaka	Urban	33
15	R.L. Jalappa High School	Urban	33
16	Vidyajyothi School	Rural	33
17	C Muniswamy School	Rural	33
18	Jnanabodha School	Rural	33
19	Government Primary School, Vokkaleri	Rural	33
20	Government Primary School, Devarayasamudra	Rural	33

ANNEXURE – VII[107,108]

SOCIO-ECONOMIC STATUS:

Modified B.G. Prasad classification was used for socioeconomic status for rural and urban families according to per capita income for month of July 2016 (Consumer Price Index for Month of August-280) latest updated.

SOCIO-ECONOMIC CLASS	PER CAPITA INCOME
Class I (Upper)	6,391 and Above
Class II (Upper Middle)	3196-6390
Class III (Middle)	1917-3195
Class IV (Lower Middle)	959-1916
Class V (Lower)	<958

ANNEXURE – VIII

DEFINITION OF VARIABLES

OPERATIONAL DEFINITIONS

AGE: The age was recorded as stated by the subject and also from the school register.

PER CAPITA INCOME:

Per capita income is total family income divided by family size.

PCI = Total family income/Family members.[107]

TYPE OF FAMILY

Nuclear: One which is composed of the husband, the wife, the minor children and direct dependent.

Joint: Composed of two or more couple and their children, including older persons related to them.

Three generation family: Representatives from three generations residing there among the households.[109]

GRADES OF GOITER

Grade 0: No palpable or visible goiter

Grade 1: A goiter that is palpable but not visible when the neck is in the normal position (i.e., the thyroid is not visibly enlarged) thyroid nodules in a thyroid which is otherwise not enlarged fall into this category

Grade 2: A swelling in the neck that is clearly visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated.[41]

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
1	Manjunath (DRS)	12	1	7	1	4	1	1	1	4	1	2	1	5	1	2	2	65	3
2	Manoj	12	1	7	1	2	1	1	1	4	1	0	1	3	2	2	2	122	3
3	Kiran	12	1	7	1	4	1	1	1	4	1	2	1	5	2	2	2	40	2
4	Srinath	12	1	7	1	3	1	1	1	4	1	1	1	4	1	2	2	102	2
5	Naveen	12	1	7	1	2	1	1	1	4	1	2	3	5	1	2	2	140	3
6	Pavan	12	1	7	1	2	1	2	1	4	3	2	3	6	2	2	2	190	3
7	Ganesh	12	1	7	1	2	1	2	1	4	2	3	1	5	3	2	2	200	3
8	Ajay	12	1	7	1	4	1	2	1	4	2	1	1	4	3	2	2	60	3
9	Shravani	12	2	7	1	4	1	2	1	4	2	1	1	5	1	2	2	125	3
10	Lokesh	12	1	7	1	2	1	1	1	4	1	1	1	4	2	2	2	128	3
11	Kavya	12	2	7	1	3	1	1	1	4	1	2	1	5	2	2	2	196	3
12	Mahalakshmi	12	2	7	1	5	1	3	1	4	4	2	1	5	3	2	2	44	3
13	Harish	12	1	7	1	4	1	1	1	4	1	0	1	3	1	2	2	117	3
14	Ajay	12	1	7	1	3	1	1	1	4	1	1	1	4	2	2	2	168	3
15	Chaitra	12	2	7	1	5	1	1	1	4	1	2	3	5	1	2	2	140	2
16	Karthik	12	1	7	1	4	1	1	1	4	2	3	3	6	2	2	2	204	3
17	Nanjegowda	12	1	7	1	3	1	1	1	4	1	0	1	3	1	2	2	204	3
18	Saranvi	12	2	7	1	4	1	1	1	4	1	1	1	3	2	2	2	201	3
19	Subramaniam	12	1	7	1	3	1	1	1	4	1	0	1	3	1	2	2	140	3
20	Sandhya	12	2	7	1	4	1	1	1	4	1	0	1	3	1	2	2	126	2
21	Poojashre	12	2	7	1	4	1	1	1	4	2	3	2	10	2	2	2	214	3
22	Naresh	12	1	7	1	5	1	1	1	4	1	1	1	4	2	2	2	124	3
23	Murali	12	1	7	1	3	1	1	1	4	2	2	1	5	1	2	2	185	3
24	Manjunath	12	1	7	1	5	1	1	1	4	1	1	1	4	3	2	2	125	3
25	Renuka	12	2	7	1	4	1	1	1	4	2	2	3	8	2	2	2	50	3
26	Chalpathi	12	1	7	1	3	1	1	1	4	1	1	1	4	2	2	2	125	2
27	Prasad Yadav	12	1	7	1	4	1	1	1	4	1	1	1	4	1	2	2	135	3
28	Nandish	12	1	7	1	3	1	1	1	4	2	2	3	6	2	2	2	140	3
29	Gangotri	12	2	7	1	3	1	1	1	4	1	4	1	6	3	2	2	55	3
30	Pavan	12	1	7	1	3	1	1	1	5	2	1	3	6	3	2	2	80	3
31	Jaykumar	12	1	7	1	3	1	1	1	5	2	1	1	4	2	2	2	60	2
32	Vena	12	2	7	1	4	1	1	1	5	2	2	1	5	3	2	2	54	3
33	Abhishek	12	1	7	1	3	1	1	1	5	1	1	1	4	1	2	2	127	2
34	Varshini	12	2	7	1	3	1	1	1	5	1	0	2	5	2	2	2	145	3
35	Gajendra	12	1	7	1	4	1	1	1	5	2	2	1	5	2	2	2	140	3
36	Venkatesh	12	1	7	1	3	1	1	1	5	1	0	1	3	1	2	2	106	2
37	Anusha	12	2	7	1	4	1	1	1	5	2	2	1	4	1	2	2	105	3
38	Nayana	11	2	6	1	3	1	1	1	5	1	1	1	4	3	2	2	117	3
39	Kusuma	11	2	6	1	4	1	3	1	5	2	2	1	5	2	2	2	145	3
40	Bhavani	11	2	6	1	4	1	3	1	5	2	1	3	8	2	2	2	140	3
41	Reshma	11	2	6	2	4	1	1	1	5	1	2	2	5	3	2	2	145	3
42	Rekha	11	2	6	1	4	1	2	1	5	2	1	3	6	3	2	2	61	3
43	Shushmitha	11	2	6	1	3	1	2	1	5	2	3	1	6	3	2	2	145	3
44	Gayatri	11	2	6	1	3	1	1	1	5	2	1	1	4	2	2	2	125	3
45	Tejaswini	11	2	6	1	3	1	1	1	5	2	2	3	6	3	2	2	140	3
46	Sushma	11	2	6	1	4	1	1	1	5	2	2	3	7	2	2	2	117	3
47	Sindhu	11	2	6	1	4	1	1	1	5	2	2	2	11	2	2	2	55	3
48	Kalpana	11	2	6	1	4	1	1	1	5	2	2	1	5	1	2	2	50	3
49	Kavya	11	2	6	1	4	1	1	1	5	2	2	1	5	2	2	2	140	3
50	Manutha	11	2	6	1	4	1	1	1	5	1	1	1	4	2	2	2	137	3

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
51	Saraswathi	11	2	6	1	3	1	1	1	5	2	2	1	5	2	2	2	135	3
52	Praveen	11	1	6	1	3	1	1	1	5	1	4	2	10	1	2	2	125	3
53	Kaushik	11	1	6	1	4	1	1	1	5	2	2	1	5	1	2	2	125	3
54	Ranjith	11	1	6	1	4	1	1	1	5	2	2	2	8	2	2	2	114	3
55	Chandrashekar	11	1	6	1	3	1	1	1	5	1	3	1	5	2	2	2	137	3
56	Ambrish	11	1	6	1	3	1	1	1	5	2	1	1	4	2	2	2	130	2
57	Mahesh	6	1	1	1	2	1	1	1	5	2	1	1	4	2	2	2	137	3
58	Purushotham	6	1	1	1	3	1	1	1	5	1	0	3	4	1	2	2	102	2
59	Darshan	6	1	1	1	2	1	1	1	5	1	0	1	3	2	2	2	120	2
60	Subramaniam	6	1	1	1	4	1	1	1	5	1	2	1	5	3	2	2	114	3
61	Neelaveni	6	2	1	1	4	1	1	1	5	1	1	1	4	3	2	2	145	3
62	Sharath	6	1	1	1	3	1	1	1	5	2	1	1	4	1	2	2	140	3
63	Sunitha	6	2	1	1	3	1	1	1	5	1	1	1	4	2	2	2	192	3
64	Sarala	6	2	1	1	4	1	1	1	5	1	0	1	3	3	2	2	105	3
65	Vijayalakshmi	6	2	1	1	2	1	1	1	5	2	1	1	4	1	2	2	125	3
66	Karthik	7	1	2	1	3	1	1	1	5	2	1	1	4	1	2	2	117	3
67	Sandhya	7	2	2	1	4	1	1	1	5	2	1	1	4	2	2	2	137	3
68	Amulya	7	2	2	1	2	1	1	1	5	2	1	1	4	2	2	2	135	3
69	Vanishree	7	2	2	1	4	1	1	1	5	1	1	1	4	3	2	2	105	3
70	Amulya M	7	2	2	1	4	1	1	1	5	1	1	1	4	2	2	2	175	3
71	Dhanush	7	1	2	1	3	1	1	1	5	2	1	3	6	3	2	2	114	3
72	Aishwarya	8	2	3	1	1	1	2	1	5	2	1	1	4	1	2	2	51	3
73	Spandana	8	2	3	1	3	1	2	1	5	2	0	1	3	2	2	2	125	3
74	Subramani V	8	1	3	1	4	1	1	1	5	2	3	3	9	2	2	2	140	3
75	Muniraj	9	1	4	1	3	1	2	1	5	2	1	1	4	2	2	2	145	3
76	Gayathri	9	2	4	1	4	1	3	1	5	2	2	1	5	2	2	2	135	3
77	Sindhu	9	2	4	1	3	1	1	1	5	1	2	1	5	3	2	2	114	3
78	Divya	9	2	4	1	4	1	1	1	5	2	1	1	4	1	2	2	180	3
79	Shilpa	9	2	4	1	2	1	1	1	5	1	1	1	4	2	2	2	145	3
80	Sirisha	9	2	4	1	4	1	1	1	5	2	2	1	5	1	2	2	145	3
81	Byregowda	6	1	1	1	3	1	1	1	5	2	4	2	12	3	2	2	145	3
82	Madhu	6	1	1	1	3	1	1	1	5	1	1	1	4	2	2	2	185	3
83	Arun	6	1	1	1	3	1	1	1	5	1	1	1	4	3	2	2	185	3
84	Nandakumar	6	1	1	1	3	1	1	1	5	2	1	1	4	3	2	2	180	3
85	Kaveri	6	2	1	1	4	1	1	1	5	1	2	1	4	3	2	2	125	3
86	Girish	6	1	1	1	3	1	1	1	5	1	1	1	4	2	2	2	140	3
87	Nandish	10	1	5	1	2	1	2	1	5	3	1	1	4	3	2	2	145	3
88	Vandana	10	2	5	1	4	1	2	1	5	4	4	2	14	3	2	2	125	3
89	Darshan	10	1	5	1	3	1	2	1	5	2	3	1	5	1	2	2	120	3
90	Kaashi	10	2	5	1	4	1	3	1	5	2	1	1	4	3	2	2	135	3
91	Manoj Kumar	10	1	5	1	3	1	3	1	5	2	0	1	3	3	2	2	140	3
92	Girish	6	1	1	1	4	1	1	1	5	1	1	1	4	1	2	2	135	3
93	Deepak	6	1	1	1	3	1	1	1	5	1	2	1	5	2	2	2	120	3
94	Tarun	6	1	1	1	3	1	1	1	5	3	4	1	6	3	2	2	140	3
95	Purushotham	6	1	1	1	4	1	1	1	5	1	0	1	3	1	2	2	140	3
96	Karthik	6	1	1	1	3	1	1	1	5	1	1	1	4	1	2	2	125	3
97	Lokesh	6	1	1	1	3	1	1	1	5	1	1	1	4	1	2	2	140	3
98	Narsimha	6	1	1	1	3	1	1	1	5	1	1	1	4	3	2	2	180	3
99	Adarsha	6	1	1	1	4	1	1	1	5	1	1	1	4	3	2	2	140	3
100	Ravi	6	1	1	1	3	1	1	1	5	2	1	1	4	2	2	2	125	3

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
101	Vinayaka	11	1	6	1	4	1	1	1	5	4	4	1	6	3	2	2	140	3
102	Chandrashekar	7	1	2	1	4	1	1	1	5	3	3	1	5	2	2	2	140	3
103	Sudarshan	7	1	2	1	4	1	1	1	5	2	2	1	5	1	2	2	140	3
104	Prakash	7	1	2	1	3	1	1	1	5	4	4	1	7	1	2	2	175	3
105	Ravi M	7	1	2	1	3	1	1	1	5	2	1	2	9	2	2	2	135	3
106	Sandeep	7	1	2	1	4	1	1	1	5	2	2	1	5	2	2	2	135	3
107	Rupesh	7	1	2	1	3	1	1	1	5	1	1	3	5	2	2	2	140	3
108	Sida(Mother Teresa School)	8	2	3	2	4	1	1	2	3	1	1	1	4	3	1	2	120	3
109	Ruksana	8	2	3	2	4	1	1	1	5	3	3	1	6	3	1	2	115	3
110	Naseeba	8	2	3	2	4	1	1	2	3	3	3	1	7	1	2	2	52	3
111	Mehek	8	2	3	2	4	1	1	2	3	1	1	1	4	3	2	2	140	3
112	Zara	8	2	3	2	4	1	1	2	3	2	2	3	6	2	2	2	120	3
113	Sadia	8	2	3	2	4	1	1	1	5	2	2	1	5	1	2	2	140	3
114	Muskaan	8	2	3	2	4	1	1	2	3	1	1	1	4	2	2	2	55	3
115	Nikita	8	2	3	1	1	1	1	2	3	1	2	1	5	2	1	2	145	3
116	Manasa	8	2	3	1	2	1	1	2	3	2	2	1	5	1	1	2	115	3
117	Nafeesa	8	2	3	2	4	1	1	2	3	1	2	1	4	2	2	2	65	3
118	Naveen	8	1	3	1	3	1	1	1	5	2	2	1	4	3	2	2	145	3
119	Madhu	8	1	3	1	4	1	1	2	3	1	1	1	3	2	2	2	105	3
120	Shivshankar	8	1	3	1	3	1	1	2	3	2	2	1	4	2	2	2	120	3
121	Varun	8	1	3	1	4	1	1	1	5	1	2	2	13	1	2	2	140	3
122	Sharan	8	1	3	1	4	1	1	2	3	2	2	2	6	2	2	2	145	3
123	Nishanth	8	1	3	1	4	1	1	2	3	2	2	3	6	1	2	2	105	3
124	Mithun	8	1	3	1	1	1	1	2	3	3	3	3	9	2	2	2	130	3
125	Chandu	8	1	3	1	4	1	1	1	5	2	2	1	4	2	2	2	137	3
126	Kiran	8	1	3	1	4	1	1	1	5	4	3	1	6	2	2	2	135	3
127	Jaykumar	8	1	3	1	1	1	1	2	3	2	2	1	6	1	2	2	114	3
128	Zabia	7	2	2	2	4	1	1	2	3	3	2	1	5	3	2	2	125	3
129	Kirthana	7	2	2	1	1	1	1	2	3	1	0	1	3	2	2	2	140	3
130	Srilekha	7	2	2	1	1	1	1	2	3	1	1	3	6	1	2	2	145	3
131	Ayesha	7	2	2	2	4	1	1	1	5	2	2	1	5	2	2	2	125	3
132	Priyanka	7	2	2	1	4	1	1	2	3	1	1	1	4	3	2	2	105	3
133	Meenakshi	7	2	2	1	1	1	1	2	3	1	0	2	4	2	1	2	137	3
134	Kirthana R	7	2	2	1	4	1	1	2	3	1	1	1	4	2	2	2	40	3
135	Rishi	7	2	2	1	1	1	1	2	3	1	1	1	4	2	2	2	114	3
136	Ayesha S	7	2	2	2	4	1	1	1	5	1	0	3	6	2	2	2	137	3
137	Naveen K	7	1	2	1	1	1	1	2	3	2	1	3	5	1	2	2	137	3
138	Likita	7	2	2	1	4	1	1	2	3	2	2	1	4	3	2	2	59	3
139	Sanjaya	7	1	2	1	4	1	1	1	5	1	0	1	3	3	2	2	145	3
140	Zeeshan	7	1	2	2	4	1	1	2	3	2	2	2	8	2	2	2	185	3
141	Pragnya	7	1	2	1	1	1	1	2	3	2	2	2	8	3	2	2	145	3
142	Tanveer	7	1	2	2	4	1	1	1	5	2	2	1	5	1	2	2	140	3
143	Chirag	7	1	2	1	1	1	1	2	3	2	2	3	6	1	2	2	125	3
144	Noor Mohammed	7	1	2	2	4	1	1	2	3	2	2	1	4	1	2	2	115	3
145	Girish	7	1	2	1	1	1	1	2	3	2	2	3	7	2	2	2	145	3
146	Rehman	7	1	2	2	4	2	1	2	3	2	2	1	4	1	2	2	140	3
147	Ranjith	7	1	2	1	1	2	1	2	2	2	2	3	6	3	2	2	140	3
148	Saad	7	1	2	2	4	2	1	1	5	2	2	1	4	1	2	2	190	3
149	Imraan	7	1	2	2	4	2	1	2	2	1	0	1	3	1	2	2	135	3
150	Afraan	6	1	1	2	4	2	1	1	5	4	3	3	7	2	2	2	130	3

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
151	Harsha	6	1	1	2	2	2	1	2	2	2	2	3	7	2	2	2	-	-
152	Keerthana	6	2	1	1	4	2	1	2	2	2	2	3	7	2	2	2	-	-
153	Harini	6	2	1	1	1	2	1	2	2	2	2	3	9	1	2	2	-	-
154	Tasmia Fatheema	6	2	1	2	4	2	1	1	5	4	3	3	10	1	2	2	-	-
155	Vyshnavi	6	2	1	1	1	2	1	2	2	1	2	3	6	1	2	2	-	-
156	Srihari	6	1	1	1	4	2	1	1	5	3	2	3	8	1	2	2	-	-
157	Likith V	6	1	1	1	4	2	1	2	2	2	1	1	5	2	2	2	-	-
158	Bhoomika K	6	2	1	1	1	2	1	2	2	1	0	1	3	1	2	2	-	-
159	Rajath	6	1	1	1	2	2	1	1	5	1	2	1	4	2	2	2	-	-
160	Pratiksha	6	2	1	1	3	2	1	1	5	2	2	1	4	2	2	2	-	-
161	Shreya	6	2	1	1	1	2	1	2	2	3	3	2	7	1	2	2	-	-
162	Bhavani	6	2	1	1	1	2	1	1	5	2	2	1	4	2	2	2	-	-
163	Shreya	6	2	1	1	1	2	1	2	2	1	2	1	4	1	2	2	-	-
164	Pravalika	6	2	1	1	4	2	1	2	2	2	2	1	4	1	2	2	-	-
165	Chandrika	6	2	1	1	2	2	1	1	5	2	2	1	4	2	2	2	-	-
166	Dishanth	6	1	1	1	1	2	1	2	2	1	1	1	3	2	2	2	-	-
167	Nandana	6	2	1	1	4	2	1	2	2	2	2	3	5	1	2	2	-	-
168	Sonakshi	6	2	1	1	2	2	1	1	5	2	2	1	4	1	2	2	-	-
169	Darsha	8	1	3	1	1	2	1	2	2	1	0	3	4	3	2	2	-	-
170	Tippu Sultan	8	1	3	2	1	2	1	1	5	2	1	1	4	1	2	2	-	-
171	Aamir	8	1	3	2	4	2	1	2	2	3	2	1	5	2	2	2	-	-
172	Samir Hussain	8	1	3	2	4	2	1	1	5	4	3	1	5	1	2	2	-	-
173	Sujith	8	1	3	1	2	2	1	1	5	2	1	1	4	1	2	2	-	-
174	Maruthi	8	1	3	1	3	2	1	2	2	2	1	1	4	2	2	2	-	-
175	Karthik	8	1	3	1	1	2	1	2	2	1	1	3	6	3	2	2	-	-
176	Vaibhav	8	1	3	1	2	2	1	1	5	3	2	3	7	3	2	2	-	-
177	Nikhil	8	1	3	1	4	2	1	2	2	3	2	3	6	1	2	2	-	-
178	Srikanth	8	1	3	1	1	2	1	1	5	3	2	3	6	2	2	2	-	-
179	Bhumika	8	2	3	1	2	2	1	2	2	1	1	1	4	1	2	2	-	-
180	Yogitha	8	2	3	1	4	2	1	1	5	3	2	1	4	1	2	2	-	-
181	Revathi	8	2	3	1	1	2	1	2	2	1	1	3	5	1	2	2	-	-
182	Kavyashree	8	2	3	1	4	2	1	1	5	2	1	1	4	1	2	2	-	-
183	Swarna	8	2	3	1	2	2	1	1	5	4	4	1	7	1	2	2	-	-
184	Rakshita S	8	2	3	1	1	2	1	2	2	2	1	3	5	1	2	2	-	-
185	Karthika M	8	1	3	1	4	2	1	1	5	2	2	1	5	1	2	2	-	-
186	Poojashre	8	2	3	1	1	2	1	2	2	2	1	1	4	1	2	2	-	-
187	Harshita	8	2	3	1	3	2	1	1	5	1	1	3	5	1	2	2	-	-
188	Lochana	8	2	3	1	1	2	1	2	3	2	1	1	4	1	2	2	-	-
189	Bhargav	7	1	2	1	1	2	1	2	3	1	1	1	4	2	2	2	-	-
190	Arjun	8	1	3	1	1	2	1	2	3	1	1	1	4	1	2	2	-	-
191	Khadar Shovim	7	1	2	2	4	2	1	1	4	2	2	1	5	2	1	2	-	-
192	Keshav	7	1	2	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
193	Musanil Ahmed Khan	7	1	2	2	4	2	1	1	4	4	3	1	6	3	2	2	-	-
194	Manoj	7	1	2	1	3	2	1	2	3	1	1	3	5	1	2	2	-	-
195	Vinay	7	1	2	1	1	2	1	2	3	1	1	1	4	1	2	2	-	-
196	Shahid	7	1	2	2	4	2	1	2	3	1	0	1	3	1	2	2	-	-
197	Chandan	7	1	2	1	4	2	1	2	3	2	2	2	5	1	2	2	-	-
198	Vikas	7	1	2	1	1	2	1	1	4	2	1	1	4	1	2	2	-	-
199	Saarika	7	2	2	1	4	2	1	2	3	1	1	3	6	1	2	2	-	-
200	Chandana	7	2	2	1	3	2	1	2	3	2	1	2	14	1	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
201	Trisha	7	2	2	1	4	2	1	2	3	2	1	1	4	1	1	2	-	-
202	Jeevan	8	2	3	1	2	2	1	1	4	2	2	2	14	2	2	2	-	-
203	Javeria Taj	11	2	6	2	4	2	3	2	3	3	3	3	7	3	2	2	-	-
204	Deepika	11	2	6	1	4	2	1	2	3	1	1	1	4	1	2	2	-	-
205	Sariya Anjum	11	2	6	2	4	2	1	2	3	2	2	1	5	1	2	2	-	-
206	Sufiya Khan	11	2	6	2	4	2	2	2	3	1	2	1	5	1	2	2	-	-
207	Afreen Taj	11	2	6	2	4	2	2	2	3	2	2	1	5	2	2	2	-	-
208	Vanitha	11	2	6	1	2	2	1	1	4	1	1	1	4	1	2	2	-	-
209	Anushree	10	2	5	1	4	2	1	2	3	1	0	1	3	1	2	2	-	-
210	Bhoomika K	10	2	5	1	1	2	1	2	3	2	1	1	4	1	1	2	-	-
211	Shravani	10	2	5	1	4	2	1	2	3	2	2	2	5	1	1	2	-	-
212	Arfat Pasha	10	1	5	2	4	2	2	2	3	2	3	1	6	2	2	2	-	-
213	Sufiya Khan	10	1	5	2	4	2	1	1	4	1	2	1	5	2	2	2	-	-
214	Pushpa	10	2	5	1	2	2	1	1	4	2	1	1	4	2	2	2	-	-
215	Noor Fathima	10	2	5	2	4	2	1	2	3	2	2	3	6	1	1	2	-	-
216	Nagarjuna	10	1	5	1	1	2	1	2	3	1	2	3	5	2	2	2	-	-
217	Yathish	10	1	5	1	4	2	1	2	3	1	0	3	5	2	2	2	-	-
218	Yashwanth	10	1	5	1	2	2	1	2	3	2	1	1	4	1	1	2	-	-
219	Bairesh	10	1	5	1	4	2	1	2	3	1	1	1	4	2	2	2	-	-
220	Riukaiya	10	2	5	2	3	2	1	1	4	2	2	1	5	1	2	2	-	-
221	Nadashree	10	2	5	1	4	2	1	2	3	1	1	1	4	1	2	2	-	-
222	Lavanya	10	2	5	1	1	2	1	2	3	1	1	1	4	1	2	2	-	-
223	Sushmita	10	2	5	1	4	2	1	2	3	2	2	3	8	2	2	2	-	-
224	Keerthi K	10	2	5	1	1	2	1	2	3	1	2	1	5	1	2	2	-	-
225	Venu	10	1	5	1	4	2	1	2	3	2	3	1	6	1	2	2	-	-
226	Yogesh	10	1	5	1	1	2	1	2	3	2	1	1	4	1	2	2	-	-
227	Rajesh	10	1	5	1	4	2	1	2	3	2	1	1	4	1	2	2	-	-
228	Kishore	10	1	5	1	4	2	1	2	3	2	2	1	5	1	2	2	-	-
229	S Pavan	9	1	4	1	1	2	1	1	4	1	1	1	4	2	2	2	-	-
230	Dhanush	9	1	4	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
231	Mokshith	9	1	4	1	4	2	1	2	3	2	1	1	5	1	2	2	-	-
232	Dhanush	9	1	4	1	3	2	1	1	4	2	1	1	4	1	2	2	-	-
233	Lokesh	9	1	4	1	4	2	1	2	3	1	1	1	4	1	2	2	-	-
234	Afeefa	9	2	4	2	4	2	1	2	3	2	3	1	5	1	2	2	-	-
235	Devika	9	2	4	1	2	2	1	1	4	1	0	1	2	1	2	2	-	-
236	Sarah Fathima	9	2	4	2	4	2	1	2	3	2	2	1	4	1	2	2	-	-
237	Husna	9	2	4	2	4	2	1	2	3	2	3	3	6	3	2	2	-	-
238	Usha S	9	2	4	1	2	2	1	1	4	2	1	1	4	1	2	2	-	-
239	Zoya Taj	9	2	4	2	4	2	1	2	3	1	2	3	7	1	2	2	-	-
240	Nandan	9	1	4	1	4	2	1	2	3	2	2	1	4	2	2	2	-	-
241	Akshaya	9	2	4	1	1	2	1	2	3	2	1	1	5	2	2	2	-	-
242	Chaitanya	9	2	4	1	4	2	1	2	3	1	1	1	4	2	2	2	-	-
243	Pujitha	9	2	4	1	1	2	1	2	3	2	2	1	4	1	2	2	-	-
244	Abid Tashan	9	2	4	2	4	2	1	1	4	1	3	1	5	1	2	2	-	-
245	Charan	9	1	4	1	2	2	1	2	3	2	2	1	4	2	2	2	-	-
246	Amjad Pasha	9	1	4	2	4	2	1	2	3	3	3	1	5	2	2	2	-	-
247	Venkatanarayana	9	1	4	1	4	2	1	2	3	2	3	3	6	3	2	2	-	-
248	Pavan Teja	9	1	4	1	2	2	1	1	4	1	0	1	3	1	2	2	-	-
249	Rakshitha(Tamaka School)	10	2	5	1	5	2	1	1	4	2	1	1	4	1	2	2	-	-
250	Ranjitha	10	2	5	1	2	2	1	1	4	2	2	1	5	2	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
251	Sushma	10	2	5	1	2	2	1	1	4	2	1	1	4	1	2	2	-	-
252	Pavan	10	1	5	1	2	2	1	2	3	1	2	1	5	2	2	2	-	-
253	Narayanaswamy	10	1	5	1	2	2	1	1	4	2	2	2	9	1	2	2	-	-
254	Sahana	10	2	5	1	2	2	1	1	4	2	2	1	5	3	2	2	-	-
255	Akshata	10	2	5	1	2	2	1	2	3	2	3	1	7	1	2	2	-	-
256	Nandini	10	2	5	1	2	2	1	1	4	1	0	1	3	1	2	2	-	-
257	Pallavi	10	2	5	1	5	2	1	2	3	2	1	2	10	2	2	2	-	-
258	Vandana	11	2	6	1	5	2	1	1	4	2	2	3	6	1	2	2	-	-
259	Gayathri	11	2	6	1	3	2	1	2	3	1	1	2	10	1	2	2	-	-
260	Priyanka	11	2	6	1	2	2	1	1	4	1	1	1	4	1	2	2	-	-
261	Partha	11	1	6	1	5	2	1	2	3	1	1	1	3	1	2	2	-	-
262	Malavika	11	2	6	1	2	2	1	1	4	2	3	3	8	2	2	2	-	-
263	Navya	11	2	6	1	2	2	1	2	3	4	3	1	6	3	2	2	-	-
264	Madhura	11	2	6	1	4	2	1	2	3	3	3	3	6	2	2	2	-	-
265	Kavana	11	2	6	1	2	2	1	1	4	3	2	1	6	1	2	2	-	-
266	Raviteja	11	2	6	1	2	2	1	2	3	2	1	1	4	1	2	2	-	-
267	Pramod	11	1	6	1	2	2	1	1	4	2	1	1	4	3	2	2	-	-
268	Vanishree	11	1	6	1	2	2	1	2	3	2	1	1	4	3	2	2	-	-
269	Darsha	11	1	6	1	2	2	1	1	4	1	1	3	9	3	2	2	-	-
270	Aditya	11	1	6	1	2	2	1	1	4	3	2	1	5	2	2	2	-	-
271	Chetan	11	1	6	1	2	2	1	2	3	2	1	3	5	3	2	2	-	-
272	Pradeep	11	1	6	1	2	2	1	1	4	3	2	1	5	3	2	2	-	-
273	Navneeta	8	2	3	1	2	2	1	2	3	1	1	3	5	1	2	2	-	-
274	Malavika	8	2	3	1	4	2	1	1	4	1	2	1	4	2	2	2	-	-
275	Supriya	8	2	3	1	2	2	1	2	3	1	1	1	4	2	2	2	-	-
276	Sneha	8	2	3	1	2	2	1	1	4	1	2	1	5	1	2	2	-	-
277	Supriya	8	2	3	1	2	2	1	2	3	2	2	1	5	2	2	2	-	-
278	Manushree	8	2	3	1	2	2	1	1	4	1	1	1	4	3	2	2	-	-
279	Usha	8	2	3	1	4	2	1	1	4	1	1	1	4	2	2	2	-	-
280	Manasa	8	2	3	1	4	2	1	2	3	3	2	3	7	2	2	2	-	-
281	Gangaraj	8	1	3	1	2	2	1	1	4	3	3	1	6	1	2	2	-	-
282	Karthik	8	1	3	1	2	2	1	2	3	2	2	1	5	1	2	2	-	-
283	Vijay Kumar	8	1	3	1	2	2	1	1	4	2	2	1	6	2	2	2	-	-
284	Santhosh	8	1	3	1	2	2	1	2	3	1	1	1	4	2	2	2	-	-
285	Vinutha	8	2	3	1	2	2	1	1	4	2	1	3	5	2	2	2	-	-
286	Radha	8	2	3	1	2	2	1	1	4	1	1	1	4	2	2	2	-	-
287	Tejaswini	8	1	3	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
288	Jaswanth	8	1	3	1	4	2	1	1	5	2	1	1	4	2	2	2	-	-
289	Akshay	8	1	3	1	2	2	1	2	3	1	1	1	4	3	2	2	-	-
290	Naveen	8	1	3	1	5	2	1	1	5	1	1	1	4	3	2	2	-	-
291	Ramya	9	2	4	1	2	2	1	2	3	1	1	1	4	2	2	2	-	-
292	Rashmi	9	2	4	1	2	2	1	1	5	1	1	1	4	1	2	2	-	-
293	Sneha	9	2	4	1	5	2	1	2	3	1	2	3	5	3	2	2	-	-
294	Manassa	9	2	4	1	2	2	1	1	5	1	1	1	6	3	2	2	-	-
295	Swati	9	2	4	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
296	Chinmayi	9	2	4	1	2	2	1	1	5	2	2	1	5	2	2	2	-	-
297	Chaitanya	9	2	4	1	2	2	1	2	3	2	2	1	5	1	2	2	-	-
298	Suchitra	9	2	4	1	3	2	1	2	3	2	2	3	7	2	2	2	-	-
299	Subhash	9	1	4	1	2	2	1	1	5	2	1	1	4	2	2	2	-	-
300	Santosh	9	1	4	1	5	2	1	1	5	1	1	1	4	3	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
301	Nayan Kumar	9	1	4	1	2	2	1	1	5	1	1	1	4	2	2	2	-	-
302	Manoj	9	1	4	1	5	2	1	2	3	1	1	1	4	2	2	2	-	-
303	Ambareesh	9	1	4	1	2	2	1	1	5	1	1	1	4	1	2	2	-	-
304	Ravichandra	9	1	4	1	5	2	1	2	3	1	1	1	4	3	2	2	-	-
305	Murgesh	9	1	4	1	2	2	1	1	5	2	2	1	5	2	2	2	-	-
306	Sirazuddin	9	1	4	1	5	2	1	2	3	1	0	1	3	2	2	2	-	-
307	Tyagraj	9	1	4	1	2	2	1	2	3	2	3	1	6	3	2	2	-	-
308	Nithya	6	2	1	1	2	2	1	2	3	2	1	1	4	1	2	2	-	-
309	Lakshmi	6	2	1	1	4	2	1	1	5	1	1	1	4	1	2	2	-	-
310	Tanu	6	2	1	1	2	2	1	2	3	2	1	2	9	2	2	2	-	-
311	Architha	6	2	1	1	2	2	1	2	3	3	2	1	5	2	2	2	-	-
312	Chaithra	6	2	1	1	3	2	1	1	5	1	1	1	4	2	2	2	-	-
313	Pavan	6	1	1	1	2	2	1	2	3	1	1	1	5	1	2	2	-	-
314	Manoj	6	1	1	1	2	2	1	1	5	2	2	1	5	1	2	2	-	-
315	Anusha	6	2	1	1	2	2	1	2	3	1	1	1	4	2	2	2	-	-
316	Varshini	6	2	1	1	1	2	1	2	3	1	0	1	3	3	2	2	-	-
317	Prerana	6	2	1	1	2	2	1	2	3	1	0	1	3	2	2	2	-	-
318	Bhagyavantha	6	1	1	1	4	2	1	2	3	1	2	1	5	1	2	2	-	-
319	Rahul	6	1	1	1	2	2	1	1	5	2	1	1	4	1	2	2	-	-
320	Dilip	6	1	1	1	4	2	1	2	3	1	1	1	4	2	2	2	-	-
321	Hemanth	6	1	1	1	2	2	1	1	5	1	1	1	4	2	2	2	-	-
322	Charan	6	1	1	1	2	2	1	2	3	2	1	1	4	2	2	2	-	-
323	Abhishek	6	1	1	2	3	2	1	2	3	2	3	1	5	2	2	2	-	-
324	Tejaswini	6	1	1	1	2	2	1	2	3	2	1	1	1	3	2	2	-	-
325	Sneha	7	2	2	1	4	2	1	2	3	1	1	3	6	1	2	2	-	-
326	Keerthana	7	2	2	1	2	2	1	2	3	2	1	1	4	1	2	2	-	-
327	Aradhya	7	2	2	1	2	2	1	1	5	2	2	1	5	2	2	2	-	-
328	Shravani	7	2	2	1	2	2	1	2	3	1	1	3	4	2	2	2	-	-
329	Gayathri	7	2	2	1	2	2	1	1	5	1	1	1	4	1	2	2	-	-
330	Mithun	7	1	2	1	4	2	1	2	3	1	1	1	5	2	2	2	-	-
331	Vijay	7	1	2	1	2	2	1	2	3	2	2	1	6	2	2	2	-	-
332	Swathi	7	2	2	1	2	2	1	1	5	1	0	1	3	2	2	2	-	-
333	Krishnamurthy	7	1	2	1	2	2	1	2	3	2	1	2	8	2	2	2	-	-
334	Sahana	7	2	2	1	5	2	1	1	5	2	2	2	8	2	2	2	-	-
335	Pavithra	7	2	2	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
336	Ramya	7	2	2	1	2	2	1	1	5	2	2	2	10	1	2	2	-	-
337	Santosh	8	1	3	1	2	2	1	2	3	1	1	1	5	1	2	2	-	-
338	Charan	8	1	3	1	4	2	1	2	3	2	1	3	5	1	2	2	-	-
339	Lakshmikanth	8	1	3	1	5	2	1	2	3	2	1	1	5	2	2	2	-	-
340	Kanthraj	8	1	3	1	1	2	1	2	3	1	1	1	4	2	2	2	-	-
341	Prajwal	8	1	3	1	2	2	1	1	5	1	1	1	4	2	2	2	-	-
342	Afrid Khan	10	1	5	2	5	2	1	2	3	2	3	2	10	2	2	2	-	-
343	Naveen Kumar	10	1	5	1	5	2	1	2	3	2	2	1	5	1	2	2	-	-
344	Lakshmi	10	2	5	1	2	2	1	2	3	2	2	1	5	1	2	2	-	-
345	Yallappa	10	1	5	1	5	2	1	2	3	1	0	1	3	1	2	2	-	-
346	Kalpana	10	2	5	1	5	2	1	2	3	2	1	3	6	2	2	2	-	-
347	Nikita	10	2	5	1	2	2	1	1	5	3	2	1	5	1	2	2	-	-
348	Yogendra	8	1	3	4	2	2	1	2	3	2	1	1	4	2	2	2	-	-
349	Abhilash(Subhash School)	6	1	1	1	4	1	1	2	3	2	2	1	4	1	1	2	-	-
350	Aishwarya	6	2	1	1	2	1	1	2	3	2	2	1	4	1	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
351	Keerthana	6	2	1	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
352	Manoj	6	1	1	1	4	1	1	1	5	2	2	1	4	2	2	1	-	-
353	Pruthvi	6	1	1	1	4	1	1	1	5	1	2	1	4	1	2	1	-	-
354	Suhas	6	1	1	1	2	1	1	1	5	2	2	3	5	1	2	1	-	-
355	Yashwanth	6	1	1	1	2	1	1	1	5	3	3	2	15	1	3	1	-	-
356	Ishanth P	6	1	1	1	2	1	1	1	5	2	2	1	4	1	3	1	-	-
357	Sharan	6	1	1	2	4	1	1	1	5	2	3	1	5	1	2	2	-	-
358	Ramya	6	2	1	1	2	1	1	1	4	2	2	1	4	1	2	2	-	-
359	Asfiya	6	2	1	2	4	1	1	1	4	1	2	1	4	1	2	2	-	-
360	Bhanushree	6	2	1	1	4	1	1	1	4	2	2	1	4	1	2	1	-	-
361	Chandrashekar	6	1	1	1	4	1	1	1	4	1	2	1	4	1	2	2	-	-
362	Anjali	6	2	1	2	4	1	1	2	3	1	2	1	4	1	3	2	-	-
363	Girish	6	1	1	1	2	1	1	1	4	2	2	1	4	2	3	2	-	-
364	Akshaya	6	2	1	1	2	1	1	1	4	2	3	1	5	1	2	2	-	-
365	Mounika	6	2	1	1	4	1	1	1	4	2	3	1	5	1	2	2	-	-
366	Mouseen	6	1	1	2	4	1	1	1	4	2	2	1	4	1	2	2	-	-
367	Afrin	6	1	1	2	4	1	1	1	4	1	1	2	5	1	2	2	-	-
368	Moulya	6	2	1	1	2	1	1	1	4	1	2	1	4	1	2	2	-	-
369	Amulya	7	2	2	1	4	1	1	1	4	2	2	1	4	1	3	2	-	-
370	Arfiya	7	2	2	2	4	1	1	1	4	3	3	2	7	2	2	2	-	-
371	Aksaf	7	1	2	2	4	1	1	1	4	1	3	1	5	2	2	2	-	-
372	Umesh	7	1	2	1	2	1	1	1	4	1	1	3	4	2	2	2	-	-
373	Uday	7	1	2	1	4	1	1	1	4	2	2	1	5	2	2	2	-	-
374	Usmaan	7	1	2	1	4	1	1	1	4	3	3	1	5	2	2	2	-	-
375	Aishwarya	7	1	2	1	4	1	1	1	4	3	3	3	8	2	2	2	-	-
376	Keerthi K	7	2	2	1	2	1	1	1	4	2	2	1	4	2	2	2	-	-
377	Kaleem	7	1	2	2	4	1	1	2	3	4	4	1	6	2	2	2	-	-
378	Chandana	7	2	2	1	4	1	1	1	4	1	3	1	4	3	2	2	-	-
379	Tanu	7	2	2	1	4	1	1	1	4	2	3	2	8	2	2	2	-	-
380	Taniya	7	2	2	2	4	1	1	1	4	2	4	1	7	1	2	2	-	-
381	Tejaswini	7	2	2	1	3	1	1	1	4	2	2	3	5	1	2	2	-	-
382	Dhanush	7	1	2	1	2	1	1	1	4	2	2	3	6	1	2	2	-	-
383	Dhanvantri	7	1	2	1	4	1	1	1	4	2	3	1	4	2	2	2	-	-
384	Dhananjay	7	1	2	1	4	1	1	1	4	2	2	1	4	3	2	2	-	-
385	Nadeem	7	1	2	2	4	1	1	1	4	1	3	3	8	2	2	2	-	-
386	Pramod	7	1	2	1	2	1	1	1	4	2	2	1	4	2	2	2	-	-
387	Manjunath	7	1	2	1	2	1	2	1	4	2	2	1	4	2	2	2	-	-
388	Pruthvi	7	1	2	1	2	1	1	1	4	2	2	1	4	2	2	2	-	-
389	Bindu	6	2	1	1	4	1	2	1	4	1	2	1	5	1	2	2	-	-
390	Sufiya Khan	8	2	3	2	4	1	1	1	5	3	3	2	8	3	2	2	-	-
391	Akshaya	8	2	3	1	3	1	1	1	5	1	1	2	5	1	2	2	-	-
392	Sumaiya	8	2	3	2	4	1	1	1	5	1	4	1	6	2	2	2	-	-
393	Kanchana	8	2	3	1	2	1	1	1	5	2	4	3	7	2	2	2	-	-
394	Rachana	8	2	3	1	4	1	1	1	5	1	2	1	4	1	2	2	-	-
395	Nitya	8	2	3	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
396	Padma	8	2	3	1	4	1	1	1	5	2	3	3	6	1	2	2	-	-
397	Pavani	8	2	3	1	2	1	1	1	5	2	2	1	6	1	2	2	-	-
398	Punith	8	1	3	1	4	1	1	1	5	2	2	1	6	3	2	2	-	-
399	Md.Shahid	8	1	3	2	4	1	1	1	5	1	3	1	5	3	2	2	-	-
400	Shashi	9	1	4	1	5	1	1	1	5	2	3	1	5	2	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
401	Vishnu	9	1	4	1	4	1	1	1	5	3	3	1	5	2	2	2	-	-
402	Akilesh	9	1	4	1	2	1	1	1	5	3	3	1	5	2	2	2	-	-
403	Md.Pasha	9	1	4	2	4	1	1	1	5	3	3	2	10	2	2	2	-	-
404	Yashwanth	9	1	4	1	3	1	1	1	5	1	1	1	3	1	2	2	-	-
405	Shashikumar	9	2	4	1	4	1	2	1	5	3	4	1	6	1	2	2	-	-
406	Pavithra	9	2	4	1	4	1	1	1	5	3	3	1	6	2	2	2	-	-
407	Anu	9	1	4	1	3	1	1	1	5	2	2	1	5	2	2	2	-	-
408	Pavan	9	1	4	1	3	1	1	1	5	1	1	1	4	2	2	2	-	-
409	Prithvi	9	1	4	1	4	1	1	1	5	1	1	1	3	1	2	2	-	-
410	Nikita	11	2	6	1	1	1	2	1	5	1	1	1	4	1	2	2	-	-
411	Varsha	11	2	6	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
412	Sridhar	11	1	6	1	5	1	1	1	5	2	2	1	4	3	2	2	-	-
413	Sundar	11	1	6	1	4	1	1	1	5	2	2	1	4	2	2	2	-	-
414	Rajesh	11	1	6	1	2	1	1	1	5	1	1	1	4	2	2	2	-	-
415	Praveen	11	1	6	1	4	1	1	1	5	3	3	1	5	2	2	2	-	-
416	Nautaj	11	1	6	2	4	1	1	1	5	2	3	1	5	3	2	2	-	-
417	Asgar	11	1	6	2	4	1	1	1	5	1	1	1	4	2	2	2	-	-
418	Praveen	11	1	6	1	3	1	1	1	5	2	3	1	5	1	2	2	-	-
419	Nikhil	11	1	6	1	2	1	1	1	5	2	3	1	5	1	2	2	-	-
420	Akilesh	11	1	6	1	4	1	1	1	5	2	2	1	4	3	2	2	-	-
421	Misba	11	2	6	2	4	1	1	1	5	2	2	1	5	2	2	2	-	-
422	Lavanya	11	2	6	1	2	1	1	1	5	2	2	1	5	3	2	2	-	-
423	Bhavana	11	2	6	1	5	1	1	1	5	2	2	3	5	3	2	2	-	-
424	Khushi	11	2	6	1	4	1	1	1	5	1	2	1	4	2	2	2	-	-
425	Ranjitha	11	2	6	1	2	1	1	1	5	2	2	1	4	2	2	2	-	-
426	Kavyashree	11	2	6	1	2	1	1	1	5	2	2	1	4	1	2	2	-	-
427	Rakshitha C	11	2	6	1	4	1	1	2	3	2	2	1	4	1	2	2	-	-
428	Divya	10	2	5	1	4	1	1	1	5	1	2	1	4	2	2	2	-	-
429	Megha	10	2	5	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
430	Lavanya	10	2	5	1	2	1	1	1	5	2	2	1	6	2	2	2	-	-
431	Bhavani	10	2	5	1	2	1	1	1	5	2	3	1	5	2	2	2	-	-
432	Sampath	10	1	5	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
433	Shireesha	10	2	5	1	4	1	1	1	5	2	3	1	5	2	2	2	-	-
434	Usha	10	2	5	1	1	1	2	1	5	1	2	3	6	3	2	2	-	-
435	Sushanth	10	1	5	1	5	1	1	1	5	1	1	3	6	2	2	2	-	-
436	Navya	10	2	5	1	1	1	1	1	5	2	2	3	6	2	2	2	-	-
437	Pavithra	10	2	5	1	1	1	1	1	5	3	3	2	10	3	2	2	-	-
438	Monica	10	2	5	1	1	1	1	1	5	2	2	3	9	1	2	2	-	-
439	Ajay	8	1	3	1	2	1	1	1	5	2	2	1	4	2	2	2	-	-
440	Vasu	8	1	3	1	3	1	1	1	5	1	3	3	5	2	2	2	-	-
441	Karthik	8	1	3	1	4	1	1	1	5	2	2	1	5	1	2	2	-	-
442	Karthik N	8	1	3	1	4	1	1	1	5	2	2	1	4	3	2	2	-	-
443	Mahita	8	2	3	1	2	1	1	1	5	2	2	1	6	1	2	2	-	-
444	Yashaswini	8	1	3	1	1	1	1	1	5	2	2	1	4	2	2	2	-	-
445	Charan	8	1	3	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
446	Pavani	8	2	3	1	2	1	1	2	3	2	2	1	4	1	2	2	-	-
447	Arfath	8	1	3	2	4	1	1	1	5	2	3	1	5	3	2	2	-	-
448	Gagana	8	2	3	1	4	1	1	1	5	2	3	1	5	1	2	2	-	-
449	Navya	8	2	3	1	1	1	1	1	5	1	1	1	3	2	2	2	-	-
450	Varsha	8	2	3	1	4	1	1	2	3	2	2	1	5	1	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
451	Kushal	9	1	4	1	1	1	1	1	5	2	2	1	4	1	2	2	-	-
452	Shashank	10	1	5	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
453	Usha	10	2	5	1	2	1	1	1	5	2	2	1	4	1	2	2	-	-
454	Vinay	10	1	5	1	1	1	1	1	5	2	2	1	4	2	2	2	-	-
455	Niranthan	10	1	5	1	4	1	1	1	5	2	2	1	4	2	2	2	-	-
456	Prashanth	10	1	5	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
457	Jagadish	10	1	5	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
458	Ajay	10	1	5	1	4	1	1	1	5	2	2	1	4	2	2	2	-	-
459	Charanya	8	2	3	1	2	1	1	1	5	1	1	1	3	1	2	2	-	-
460	Pooja	8	2	3	1	1	1	1	1	5	2	3	1	5	1	2	2	-	-
461	Shravani	8	2	3	1	2	1	1	1	5	2	3	1	5	1	2	2	-	-
462	Chandini	8	2	3	1	2	1	1	1	5	2	2	1	4	1	2	2	-	-
463	Uday	8	1	3	1	1	1	1	1	5	3	3	1	5	3	2	2	-	-
464	Nitin	8	1	3	1	3	1	1	1	5	2	3	1	5	1	2	2	-	-
465	Tanu	8	2	3	1	4	1	1	2	3	2	2	3	5	2	2	2	-	-
466	Sharan	8	1	3	1	4	1	1	1	5	2	2	1	4	2	2	2	-	-
467	Vishishta	8	1	3	1	4	1	1	1	5	2	2	1	4	1	2	2	-	-
468	Sudhakar	9	1	4	1	4	1	2	1	5	2	3	2	10	1	2	2	-	-
469	Akash	9	1	4	1	4	1	1	1	4	2	3	1	5	2	2	2	-	-
470	Manjunath	9	1	4	1	2	1	1	1	4	2	2	1	4	1	2	2	-	-
471	Geetha	9	2	4	1	4	1	1	1	4	2	2	1	4	1	2	2	-	-
472	Anusha	9	2	4	1	2	1	1	1	4	2	2	1	4	1	2	2	-	-
473	Akash	9	1	4	1	4	1	1	1	4	2	2	2	6	1	2	2	-	-
474	Ayan	9	2	4	2	4	1	1	1	4	2	2	1	4	2	2	2	-	-
475	Karthik	9	1	4	1	2	1	1	1	4	2	3	1	5	1	2	2	-	-
476	Sahana	9	2	4	1	4	1	1	1	4	2	2	1	4	1	2	2	-	-
477	Abhishek	9	1	4	1	4	1	1	1	4	3	3	1	5	1	2	2	-	-
478	Darshan	9	1	4	1	2	1	1	1	4	2	2	3	7	1	2	2	-	-
479	Vrushika	9	2	4	1	4	1	1	2	2	2	3	1	6	1	2	2	-	-
480	Venkatesha	9	1	4	1	1	1	1	1	4	2	3	3	6	2	2	2	-	-
481	Hazriya	9	2	4	2	4	1	1	1	4	2	3	1	5	1	2	2	-	-
482	Pallavi	9	2	4	1	1	1	1	2	2	2	2	1	4	1	2	2	-	-
483	Gagana	9	2	4	1	4	1	1	2	2	2	3	3	6	1	2	2	-	-
484	Akshay	9	1	4	1	4	1	1	1	4	2	2	3	8	1	2	2	-	-
485	Krishnamurthy	9	1	4	1	4	1	1	1	4	2	2	1	4	1	2	2	-	-
486	Aishwarya	9	2	4	1	4	1	1	1	4	2	3	3	6	1	2	2	-	-
487	Gagana	9	1	4	2	4	1	1	1	4	2	3	1	5	1	2	2	-	-
488	Naveen	10	1	5	2	4	1	1	1	4	2	2	2	10	1	2	2	-	-
489	Virat	10	1	5	1	4	1	1	1	4	2	2	1	4	1	2	2	-	-
490	Zabia	7	2	2	2	4	2	1	2	2	3	2	1	5	3	2	2	-	-
491	Kirthana	7	2	2	1	1	2	1	2	2	1	0	1	3	2	2	2	-	-
492	Srilekha	7	2	2	1	1	2	1	2	2	1	1	3	6	1	2	2	-	-
493	Ayesha	7	2	2	2	4	2	1	1	4	2	2	1	5	2	2	2	-	-
494	Priyanka	7	2	2	1	4	2	1	2	2	1	1	1	4	3	2	2	-	-
495	Meenakshi	7	2	2	1	1	2	1	2	2	1	0	2	4	2	1	2	-	-
496	Kirthana R	7	2	2	1	4	2	1	2	2	1	1	1	4	2	2	2	-	-
497	Rishi	7	2	2	1	1	2	1	2	2	1	1	1	4	2	2	2	-	-
498	Ayesha S	7	2	2	2	4	2	1	1	4	1	0	3	6	2	2	2	-	-
499	Naveen K	7	1	2	1	1	2	1	2	2	2	1	3	5	1	2	2	-	-
500	Likita	7	2	2	1	4	2	1	2	2	2	2	1	4	3	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
501	Sanjaya	7	1	2	1	4	2	1	1	4	1	0	1	3	3	2	2	-	-
502	Zeeshan	7	1	2	2	4	2	1	2	2	2	2	2	8	2	2	2	-	-
503	Pragnya	7	1	2	1	1	2	1	2	2	2	2	2	8	3	2	2	-	-
504	Tanveer	7	1	2	2	4	2	1	1	4	2	2	1	5	1	2	2	-	-
505	Chirag	7	1	2	1	1	2	1	2	2	2	2	3	6	1	2	2	-	-
506	Noor Mohammed	7	1	2	2	4	2	1	2	2	2	2	1	4	1	2	2	-	-
507	Girish	7	1	2	1	1	2	1	2	2	2	2	3	7	2	2	2	-	-
508	Rehman	7	1	2	2	4	2	1	2	2	2	2	1	4	1	2	2	-	-
509	Ranjith	7	1	2	1	1	2	1	2	2	2	2	3	6	3	2	2	-	-
510	Saad	7	1	2	2	4	2	1	1	4	2	2	1	4	1	2	2	-	-
511	Imraan	7	1	2	2	4	2	1	2	2	1	0	1	3	1	2	2	-	-
512	Afraan	6	1	1	2	4	2	1	1	4	4	3	3	7	2	2	2	-	-
513	Harsha	6	1	1	2	2	2	1	2	2	2	2	3	7	2	2	2	-	-
514	Keerthana	6	2	1	1	4	2	1	2	2	2	2	3	7	2	2	2	-	-
515	Harini	6	2	1	1	1	2	1	2	2	2	2	3	9	1	2	2	-	-
516	Tasmia Fatheema	6	2	1	2	4	2	1	1	4	4	3	3	10	1	2	2	-	-
517	Vyshnavi	6	2	1	1	1	2	1	2	2	1	2	3	6	1	2	2	-	-
518	Srihari	6	1	1	1	4	2	1	1	4	3	2	3	8	1	2	2	-	-
519	Likith V	6	1	1	1	4	2	1	2	2	2	1	1	5	2	2	2	-	-
520	Bhoomika K	6	2	1	1	1	2	1	2	2	1	0	1	3	1	2	2	-	-
521	Rajath	6	1	1	1	2	2	1	1	4	1	2	1	4	2	2	2	-	-
522	Pratiksha	6	2	1	1	3	2	1	1	4	2	2	1	4	2	2	2	-	-
523	Shreya	6	2	1	1	1	2	1	2	2	3	3	2	7	1	2	2	-	-
524	Bhavani	6	2	1	1	1	2	1	1	4	2	2	1	4	2	2	2	-	-
525	Shreya	6	2	1	1	1	2	1	2	2	1	2	1	4	1	2	2	-	-
526	Pravalika	6	2	1	1	4	2	1	2	2	2	2	1	4	1	2	2	-	-
527	Chandrika	6	2	1	1	2	2	1	1	4	2	2	1	4	2	2	2	-	-
528	Dishanth	6	1	1	1	1	2	1	2	2	1	1	1	3	2	2	2	-	-
529	Nandana	6	2	1	1	4	2	1	2	2	2	2	3	5	1	2	2	-	-
530	Sonakshi	6	2	1	1	2	2	1	1	4	2	2	1	4	1	2	2	-	-
531	Darsha	9	1	4	1	1	2	1	2	2	1	0	3	4	3	2	2	-	-
532	Tippu Sultan	9	1	4	2	1	2	1	1	4	2	1	1	4	1	2	2	-	-
533	Aamir	9	1	4	2	4	2	1	2	2	3	2	1	5	2	2	2	-	-
534	Samir Hussain	9	1	4	2	4	2	1	1	4	4	3	1	5	1	2	2	-	-
535	Sujith	9	1	4	1	2	2	1	1	4	2	1	1	4	1	2	2	-	-
536	Maruthi	9	1	4	1	3	2	1	2	2	2	1	1	4	2	2	2	-	-
537	Karthik	12	1	7	1	1	2	1	2	2	1	1	3	6	3	2	2	-	-
538	Vaibhav	12	1	7	1	2	2	1	1	4	3	2	3	7	3	2	2	-	-
539	Nikhil	12	1	7	1	4	2	1	2	2	3	2	3	6	1	2	2	-	-
540	Srikanth	12	1	7	1	1	2	2	1	4	3	2	3	6	2	2	2	-	-
541	Bhumika	12	2	7	1	2	2	3	2	2	4	1	1	4	1	2	2	-	-
542	Yogitha	12	2	7	1	4	2	1	1	4	3	2	1	4	1	2	2	-	-
543	Revathi	12	2	7	1	1	2	1	2	2	1	1	3	5	1	2	2	-	-
544	Kavyashree	12	2	7	1	4	2	1	1	4	2	1	1	4	1	2	2	-	-
545	Swarna	12	2	7	1	2	2	1	1	4	4	4	1	7	1	2	2	-	-
546	Rakshita S	12	2	7	1	1	2	1	2	2	2	1	3	5	1	2	2	-	-
547	Karthika M	12	1	7	1	4	2	1	1	4	2	2	1	5	1	2	2	-	-
548	Poojashre	12	2	7	1	1	2	1	2	2	2	1	1	4	1	2	2	-	-
549	Harshita	12	2	7	1	3	2	2	1	4	1	1	3	5	1	2	2	-	-
550	Lochana	12	2	7	1	1	2	1	2	2	2	1	1	4	1	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
551	Bhargav	11	1	6	1	1	2	1	2	2	1	1	1	4	2	2	2	-	-
552	Arjun	12	1	7	1	1	2	1	2	2	1	1	1	4	1	2	2	-	-
553	Khadar Shovim	11	1	6	2	4	2	1	1	4	2	2	1	5	2	1	2	-	-
554	Keshav	11	1	6	1	2	2	1	2	2	1	1	1	4	1	2	2	-	-
555	Musanil Ahmed Khan	11	1	6	2	4	2	1	1	4	4	3	1	6	3	2	2	-	-
556	Manoj	11	1	6	1	3	2	1	2	2	1	1	3	5	1	2	2	-	-
557	Vinay	11	1	6	1	1	2	1	2	2	1	1	1	4	1	2	2	-	-
558	Shahid	11	1	6	2	4	2	1	2	2	1	0	1	3	1	2	2	-	-
559	Chandan	11	1	6	1	4	2	1	2	2	2	2	2	5	1	2	2	-	-
560	Vikas	11	1	6	1	1	2	1	1	4	2	1	1	4	1	2	2	-	-
561	Saarika	11	2	6	1	4	2	1	2	2	1	1	3	6	1	2	2	-	-
562	Chandana	11	2	6	1	3	2	1	2	2	2	1	2	14	1	2	2	-	-
563	Trisha	11	2	6	1	4	2	1	2	2	2	1	1	4	1	1	2	-	-
564	Jeevan	11	2	6	1	2	2	1	1	4	2	2	2	14	2	2	2	-	-
565	Javeria Taj	11	2	6	2	4	2	1	2	2	1	3	3	7	1	2	2	-	-
566	Deepika	11	2	6	1	4	2	1	2	2	1	1	1	4	1	2	2	-	-
567	Sariya Anjum	11	2	6	2	4	2	1	2	2	2	2	1	5	1	2	2	-	-
568	Sufiya Khan	11	2	6	2	4	2	1	2	2	1	2	1	5	1	2	2	-	-
569	Afreen Taj	11	2	6	2	4	2	1	2	2	2	2	1	5	2	2	2	-	-
570	Vanitha	11	2	6	1	2	2	1	1	4	1	1	1	4	1	2	2	-	-
571	Anushree	10	2	5	1	4	2	1	2	2	1	0	1	3	1	2	2	-	-
572	Bhoomika K	10	2	5	1	1	2	1	2	2	2	1	1	4	1	1	2	-	-
573	Shravani	10	2	5	1	4	2	1	2	2	2	2	2	5	1	1	2	-	-
574	Arfat Pasha	10	1	5	2	4	2	1	2	3	2	3	1	6	2	2	2	-	-
575	Sufiya Khan	10	1	5	2	4	2	1	1	4	1	2	1	5	2	2	2	-	-
576	Pushpa	10	2	5	1	2	2	1	1	4	2	1	1	4	2	2	2	-	-
577	Noor Fathima	10	2	5	2	4	2	1	2	3	2	2	3	6	1	1	2	-	-
578	Nagarjuna	10	1	5	1	1	2	1	2	3	1	2	3	5	2	2	2	-	-
579	Yathish	10	1	5	1	4	2	1	2	3	1	0	3	5	2	2	2	-	-
580	Yashwanth	10	1	5	1	2	2	1	2	3	2	1	1	4	1	1	2	-	-
581	Bairesh	10	1	5	1	4	2	1	2	3	1	1	1	4	2	2	2	-	-
582	Riukaiya	10	2	5	2	3	2	1	1	4	2	2	1	5	1	2	2	-	-
583	Nadashree	10	2	5	1	4	2	1	2	3	1	1	1	4	1	2	2	-	-
584	Lavanya	10	2	5	1	1	2	1	2	3	1	1	1	4	1	2	2	-	-
585	Sushmita	10	2	5	1	4	2	1	2	3	2	2	3	8	2	2	2	-	-
586	Keerthi K	10	2	5	1	1	2	1	2	3	1	2	1	5	1	2	2	-	-
587	Venu	10	1	5	1	4	2	1	2	3	2	3	1	6	1	2	2	-	-
588	Yogesh	10	1	5	1	1	2	1	2	3	2	1	1	4	1	2	2	-	-
589	Rajesh	10	1	5	1	4	2	1	2	3	2	1	1	4	1	2	2	-	-
590	Kishore	10	1	5	1	4	2	1	2	3	2	2	1	5	1	2	2	-	-
591	S Pavan	9	1	4	1	1	2	1	1	4	1	1	1	4	2	2	2	-	-
592	Dhanush	9	1	4	1	2	2	1	2	3	1	1	1	4	1	2	2	-	-
593	Mokshith	9	1	4	1	4	2	1	2	3	2	1	1	5	1	2	2	-	-
594	Dhanush	9	1	4	1	3	2	1	1	4	2	1	1	4	1	2	2	-	-
595	Lokesh	9	1	4	1	4	2	1	2	3	1	1	1	4	1	2	2	-	-
596	Afeefa	9	2	4	2	4	2	1	2	3	2	3	1	5	1	2	2	-	-
597	Devika	9	2	4	1	2	2	1	1	4	1	0	1	2	1	2	2	-	-
598	Sarah Fathima	9	2	4	2	4	2	1	2	3	2	2	1	4	1	2	2	-	-
599	Husna	9	2	4	2	4	2	1	2	3	2	3	3	6	3	2	2	-	-
600	Usha S	9	2	4	1	2	2	1	1	4	2	1	1	4	1	2	2	-	-

Sl.No.	Name	Age (years)	Gender (male-1, female-2)	Class	Religion (Hindu-1, Muslim-2, Christian-3, Others-4)	Caste (General-1, SC-2, ST-3, OBC-4, Others-5)	Residence (Rural-1, Urban-2)	Grade of Goiter (Grade 1-1, Grade 2 -2, Grade 3-3)	BPL/APL (APL-2, BPL-1)	Socioeconomic Class (Upper High-1, High-2, Upper Middle-3, Lower Middle-4, Lower-5)	Birth Order	Number of Siblings	Type of Family (Nuclear-1, Joint-2, Three Generation-3)	Number of Family Members	Grade in Previous Class (Grade A-1, Grade B-2, Grade C-3)	Type of Cooking Salt used (Packaged Crushed Salt-1, Packaged Crystal Salt-2, Loose Crystal Salt-3)	Knowledge on Iodised Salt (Yes-1, No-2)	Urine iodine (micro gm/L)	Salt Iodine (1-No Iodine, 2-Inadequate Iodine, 3-Adequate Iodine)
601	Zoya Taj	9	2	4	2	4	2	1	2	3	1	2	3	7	1	2	2	-	-
602	Nandan	9	1	4	1	4	2	1	2	3	2	2	1	4	2	2	2	-	-
603	Akshaya	9	2	4	1	1	2	1	2	3	2	1	1	5	2	2	2	-	-
604	Chaitanya	9	2	4	1	4	2	1	2	3	1	1	1	4	2	2	2	-	-
605	Pujitha	9	2	4	1	1	2	1	2	3	2	2	1	4	1	2	2	-	-
606	Abid Tashan	9	2	4	2	4	2	1	1	4	1	3	1	5	1	2	2	-	-
607	Charan	9	1	4	1	2	2	1	2	3	2	2	1	4	2	2	2	-	-
608	Amjad Pasha	9	1	4	2	4	2	1	2	3	3	3	1	5	2	2	2	-	-
609	Venkatanarayana	9	1	4	1	4	2	1	2	3	2	3	3	6	3	2	2	-	-
610	Pavan Teja	9	1	4	1	2	2	1	1	4	1	0	1	3	1	2	2	-	-
611	Kiran	12	1	7	1	4	1	1	1	4	2	2	1	5	2	2	2	-	-
612	Srinath	12	1	7	1	3	1	1	1	4	1	1	1	4	3	2	2	-	-
613	Naveen	12	1	7	1	2	1	1	1	4	2	2	3	5	1	2	2	-	-
614	Pavan	12	1	7	1	2	1	1	1	4	3	2	3	6	2	2	2	-	-
615	Ganesh	12	1	7	1	2	1	1	1	4	2	3	1	5	1	2	2	-	-
616	Ajay	12	1	7	1	4	1	1	1	4	2	1	1	4	1	2	2	-	-
617	Shravani	12	2	7	1	4	1	2	1	4	2	1	1	5	1	2	2	-	-
618	Lokesh	12	1	7	1	2	1	1	1	4	1	1	1	4	2	2	2	-	-
619	Kavya	12	2	7	1	3	1	1	1	4	2	2	1	5	2	2	2	-	-
620	Mahalakshmi	12	2	7	1	5	1	1	1	4	2	2	1	5	3	2	2	-	-
621	Harish	12	1	7	1	4	1	1	1	4	1	0	1	3	3	2	2	-	-
622	Ajay	12	1	7	1	3	1	1	1	4	1	1	1	4	2	2	2	-	-
623	Chaitra	12	2	7	1	5	1	3	1	4	2	2	3	5	1	2	2	-	-
624	Karthik	12	1	7	1	4	1	1	1	4	2	3	3	6	2	2	2	-	-
625	Nanjegowda	12	1	7	1	3	1	3	1	4	1	0	1	3	3	2	2	-	-
626	Saranvi	12	2	7	1	4	1	2	1	4	1	1	1	3	2	2	2	-	-
627	Subramaniam	12	1	7	1	3	1	1	1	4	1	0	1	3	1	2	2	-	-
628	Sandhya	12	2	7	1	4	1	1	1	4	1	0	1	3	1	2	2	-	-
629	Poojashre	12	2	7	1	4	1	1	1	4	2	3	2	10	2	2	2	-	-
630	Naresh	12	1	7	1	5	1	1	1	4	1	1	1	4	2	2	2	-	-
631	Murali	12	1	7	1	3	1	1	1	4	2	2	1	5	3	2	2	-	-
632	Manjunath	12	1	7	1	5	1	3	1	4	1	1	1	4	3	2	2	-	-
633	Renuka	12	2	7	1	4	1	2	1	4	2	2	3	8	2	2	2	-	-
634	Chalpathi	12	1	7	1	3	1	1	1	4	1	1	1	4	2	2	2	-	-
635	Prasad Yadav	12	1	7	1	4	1	1	1	4	1	1	1	4	1	2	2	-	-
636	Nandish	12	1	7	1	3	1	1	1	4	2	2	3	6	2	2	2	-	-
637	Gangotri	12	2	7	1	3	1	2	1	4	4	4	1	6	3	2	2	-	-
638	Pavan	12	1	7	1	3	1	1	1	4	2	1	3	6	3	2	2	-	-
639	Jaykumar	12	1	7	1	3	1	2	1	4	2	1	1	4	2	2	2	-	-
640	Vena	12	2	7	1	4	1	2	1	4	2	2	1	5	3	2	2	-	-
641	Abhishek	12	1	7	1	3	1	1	1	4	1	1	1	4	1	2	2	-	-
642	Varshini	12	2	7	1	3	1	3	1	4	1	0	2	5	2	2	2	-	-
643	Gajendra	12	1	7	1	4	1	1	1	4	2	2	1	5	2	2	2	-	-
644	Venkatesh	12	1	7	1	3	1	1	1	4	1	0	1	3	1	2	2	-	-
645	Anusha	12	2	7	1	4	1	1	1	4	2	2	1	4	1	2	2	-	-
646	Nayana	11	2	6	1	3	1	2	1	4	1	1	1	4	3	2	2	-	-
647	Kusuma	11	2	6	1	4	1	2	1	4	2	2	1	5	2	2	2	-	-
648	Akshaya	6	2	1	1	2	1	1	1	4	2	3	1	5	1	2	2	-	-
649	Usmaan	7	1	2	1	4	1	1	1	4	3	3	1	5	2	2	2	-	-
650	Yogitha	8	2	3	1	4	2	1	1	5	3	2	1	4	1	2	2	-	-