EFFICACY OF IODIZED SALT IN THE REDUCTION OF IODINE

Deficiency In Ila Local Government Area, Osun State, Nigeria

Objective: Assessment Of Iodine Status Of Primary School Children In Ila Local Government.

INTRODUCTION

Iodine Deficiency- the world's single greatest cause of preventable mental retardation – had been an important public health problem in Nigeria ever before alerting the Federal ministry of Health in 1965(1). Findings in 1987 led to the production of the first goitre map for Nigeria in 1988 which reported the Total Goitre Rate (TGR) to be 67%, of which the nutritional average was about 40% (2). A 16 states survey in 1993 reported a drop in TGR to 20% following the implementation of the Federal Government Acts that all food grade salt (both for human and animal consumption) should be iodized at 50 ppm (3), and a further decline to an average of 10.6% in the same 16 states was recorded (4), Urinary Iodine Excretion (UIE) was not measured in these surveys. Biochemical assessments with urinary iodine mirror the lowered TGR recorded during the 1990's, report of 1998 study revealed mean levels of urinary Iodine of 146.5 µg/L with a median of 133.9 µg/L, ranging from 90 – 156 µg/L over 10 states surveyed(5). The results of Nigeria Food Consumption and Nutrition Survey (NFCNS) in 2001-2003 also indicated UIE median of 183.7 µg/L and a mean value of 249.5 µg/L in children under 5 (6), and that of National survey 2004 to assess Universal Salt Iodization impact and progress in general, and

in Endemic zones revealed a median UIE supporting virtual IDD elimination (7).

Quickest way of eliminating IDD is by Universal Salt Iodization (8), which is the engine for the remarkable achievement in Nigeria. Although several efforts to establish IDD control programme failed to gather momentum from 1974 – 1990 but with multi sectoral efforts, USI was established in 1992. Since 1995 records from Standard Organization of Nigeria (SON) and UNICEF MICS show that Nigerian consume adequately iodized salt(9). Approximately 20, 000 salt Samples have been analyzed both at wholesale, retail and household level, results consistently indicate that access to adequately iodized salt is over 98%(10).

The report of NFCNS 2001 – 2003 in Osun State (part of the goitre belt in Nigeria) showed median urinary iodine concentration of 173.5 µg/L and severe deficiency of 1.5% indicating IDD. Various research works have been reported in different regions in Nigeria since 2003 to reassess the iodine nutritional status in the country, but there is a lack of more recent data in Ila Local Government (one of the local governments surveyed-NFCNS 2001-2003). This study was therefore designed to assess adequacy of iodine content of salt at the household level and also intake by measuring urinary iodine in 6 – 11 years old school children in Ila Local Government Area of Osun State, Nigeria

MATERIALS AND METHOD

This cross sectional descriptive study was carried out among school age children aged 6-11 years in primary schools in Ila local government Area between March and April 2009. Ila local government Osun state was one of the local governments surveyed during NFCNS 2001-2003 (6) the local government has 55 primary school as at the time of this survey, 18 (public) and 37 (private). The inhabitants of Ila Local Government are mainly civil servants, traders, artisans and farmers. Major crops produce include cassava, yam, maize, fruit and vegetables. The local government is within moist savanna region of agro-ecological zone in Nigeria.

Four schools were selected, 346(60%) of the sample size was from the public schools while 230(40%) was from the private schools.

208(60%) of the public school children were from the urban area and 40% (136) were selected from the rural area. All the children were examined for enlargement of the thyroid glands using the WHO technique, and were graded as 0, 1 or 2. First forty eight children examined in each school produced casual urine samples (192 in all) that were analyzed for urinary iodine excretion at the Chemical Pathology Laboratory in the Department of Endocrine Metabolism, University College Hospital (UCH) in Ibadan, Nigeria. Fifty one (51) salt samples from households were tested using the rapid field test kit. Socio-demographic data as well as nutritional and iodine data were collected using self administered, pre-tested structured questionnaires. The body weight was measured with bathroom scale on a firm horizontal surface, measurement taken to the nearest 0.1kg and children wearing light school uniform, shoes and belt removed. Height was measured to the nearest 0.1m using a non-stretchable standard meter rule with the subject standing erect, heels together and a scale placed on the topmost point on the head. Indices of stunting, underweight and wasting were derived using Epi. Info (centers for Disease Control / WHO) version 3.5.1. 2008. Data was analyzed using statistical package for social science (SPSS) soft-ware version 13.0 Informed consent for the study was obtained from the State Universal Basic Education Boards (SUBEB) and the Local Government Education Authority (LGEA). Permission was also obtained from headmasters of the schools for the study to be carried out.

RESULTS

Five hundred and seventy-six (576) questionnaires were administered out of which two were not analyzed due to lack of adequate information, giving a response rate of 574(99.7%). The study population was made up of 300 female (52.3%) and 274 male (47.7%). The mean age was 8.63 ± 0.07 years. The highest proportion of the respondent 160 (27.9%) were in primary three (age range 8-10 years) followed by those in primary one 144 (25.1%) age range 6-8 years. One hundred and ninety two (192) urine samples were analyzed, 48(25%) from the rural area, 144(75%) from the urban. A total of 30.8% of the children suffered various degrees of iodine deficiency while 29.7% had more than adequate level.

There was no severe deficiency. mild to moderate deficiency was seen in 1.6%, mild deficiency in 29.2%, 39.1% had optimal level of iodine. However 29.7% of the children had more than adequate level while only 0.5% had a possible excessive intake of iodine (Table 1). In the view of iodine nutrition across the four schools (fig 1, table 2), deficiency of iodine was reported in 31.3% of the children in the rural area and 30.5% of the children in the urban area. Deficiency of iodine was seen in 28.1% of the children surveyed in the public schools (Local Authority and Baptist Ajaba) and 49.0% in children surveyed in the privately owned schools (Baptist and Camila). Highest percentage of optimal iodine level 52.1% was reported in one of the private schools (Baptist). Thyroid gland exermination showed that in 567 (98.8%) it was neither palpable nor visible (0) while in 7 (1.2%) it was not visible but palpable (grade 1), out of 1.2% grade 1, the highest prevalence 0.9% was reported among the children from Baptist (private-Urban), percentage urban was 1.0%, while the lowest prevalence 0% was recorded in Camila (private-Urban).Table 5. Ninety eight percent 98% of the salt tested at the household level had more than 15ppm iodine while only 1.96% had less than 15ppm.

Considering the nutrition status of the children, the data showed that 81.9% of the children surveyed fell between ± 2SD of stunting, 84.1% ± 2SD of underweight and 92.8% ± 2SD of wasting. 18.25 of the children were stunted {12.7% mild to moderate (< -2SD), 5.5 % severely stunted (< -3SD)}. 15.9% were underweight {14.7% mild to moderate (< -2SD), 1.2% severe underweight (<-3SD)} while 7.2% of the children were wasted {5.6% mild to moderate (< -2SD) and 1.6 % severely wasted (< -3SD)}.Table 6.

DISCUSSION

The wheel model for IDD elimination programme is driven by the marker of salt iodine consumption and the urine iodine excretion of the community. Urinary Iodine Excretion provides an excellent indication of recent iodine intake. As shown in table 1, the proportion of children with UIE below 50µg/l were lower than 20% (1.6%) and that below 100µg/l were lower than 50% (30.8%). The indicator of salt iodization was also met as the percentage of households consuming

effectively iodized salt was greater than 90% (98% of the salt tested at the household level had more than 15ppm), also the proportion with enlarged thyroid (by palpation) in the school children (not visible but palpable, grade 1) was 1.2% (less than the stipulated 5%).There was no severe iodine deficiency. Table 4 compares the results of data on UIE in Osun during NFCNS 2001 – 2003 and that of Ila Local Government 2009. There was no severe form of iodine deficiency as compared to 1.55% recorded in Osun state. Level of moderate iodine deficiency has also reduced (1.6%) as compared to 8.5% recorded in 2001. There are also increased levels of both optimal and more than adequate iodine status 39.1% and 29.7%. Prevalence of excessive intake has also reduced from 26.8% to 0.1%. Although, general iodine nutrition in Ila Local Government has improved, however, the value of mild iodine deficiency is higher (29.2%) than what was recorded (15.8%) in 2001 survey. This may be due in part to time of the survey as month of March and April marks the beginning of planting season when level of household food security is down and many families turn to cheaper food item such as cassava products which contains naturally occurring goitrogen (cyanoglucosides) that inhibit thyroid iodide transport (14). The result of this survey shows that stunting [which reflect a continuing process of "failing to grow" in older children and a reflexion of having failed to grow (13)] has reduced from 29.7% (mild), 17.4% moderate to 12.7% mild-moderate and 12.5% (severe) to 5.5%. Underweight from 40.3% (mild), 16.8 (moderate) to 14.7% mild-moderate and from 2.6% severe to 1.2% severe. Also prevalence of wasting has also reduced from 25.3% mild, 4.6 moderate to 5.6% moderate. However severe form wasting 1.3% recorded for Osun state has gone up to 1.8% (table 7). The improved nutrition may be credited to nutrition programme in Osun State especially, school feeding programme, vitamin A supplementation and intermittent deworming which the state government embarked on as an action to improve the nutritional status of the children in the state as Osun state was reported to have one of the highest prevalence of under nutrition in Nigeria (NFCNS 2001-2003).Iodine an essential component of thyroid hormones function as regulator of cell activities and growth, promoting maturation of peripheral tissues(16).Although, the Iodine nutrition of the

children is adequate yet the effect of Iodine only result growth and maturation of tissues when adequate energy requirement is met. Staple grains (rice, beans and corn) and tuber (yam and cassava) are the major source of complex carbohydrate in Nigeria. The result of just concluded market survey conducted in the department of Human Nutrition University of Ibadan Nigeria(15) shows that prices of food has generally increased, price of some food items doubling the cost one to two years ago. This to a great extend will have a negative impact on household food security reflecting in increased prevalence of wasting recorded in this study.

The low goitre rate, and adequate urinary iodine excretion suggest adequate intake and efficiency of Iodized Salt in addressing the problem of IDD.

To further asses the impact of IDD elimination, we therefore recommend an assessment of improvement in IQ in children due to iodine malnutrition.

ACKNOWLEDGEMENT

The authors wish to express their appreciation to all the primary school children who participated in the study for their co-operation during data collection.

Keywords; salt, IDD, Ila, school age children

By

Ekomaye A.A.B.Sc

Sanusi R.A. MBBS (Lagos) M.Sc (Nutr.), PhD

Department of Human Nutrition

College of Medicine,

University of Ibadan,

Nigeria

* Corresponding Author

E-mail; aderonke.abike@yahoo.com

Phone +234-806-6470866

REFERENCES

1. Ekpenchi et al., from essence of life, egbuta, 1993
2. Isichel UP., Dass, egbuta JO., Banwo A1., Norinoto I., Nagataki S Endemic goitre in Plateau state, Nigeria: the possible aetiologycal factors and the establishment of Endemic goitre map for the region in: proceeding of the Nigeria/Japan conference. University of Jos press, 1987, 74-9
3. Essence of life, Egbuta 1993
4. From children & women's rights in Nigeria: A Wake-Up Call, UNICEF 2001
5. Onyenekwe B et al., consultancy report on impact evaluation of USI programme in Nigeria unicef Nigeria 1999

6.Maziya-Dixon B, Akinyele 1.0 Oguntona, E.B, Nokoe S, Sanusi R.A. and Harris E. Nigeria food consumption and Nutrition Survey 2001-2003 summary, international institute of tropical Agriculture (IITA) Ibadan Nigeria

7. Daniel N, Lantum, Did universal salt iodination help reduce the impact mortality rate in Nigeria?
8. Egbuta, Frank, Onyezili, impact evaluation of efforts to maintain iodine deficiency disorders in Nigeria. Public Health Nutrition 2002
9. Essence of life, egbuta, John, 1993
10. Akunyili Dora N. Achieving and sustaining Universal salt iodization (USI) Doing it well through regulation and enforcement, lesson learned from USI in Nigeria. Universal salt iodization (USI) SCN news no 35 end 2007 pp 43-7
11. Hetzel S. Global progress in Addressing iodine deficiency through USI: The makings of a Global public health success story. The first decade (1985-1995. SCN news no 35 end 2007 pp 9
12. Hetzel S. Global Progress in Addressing Iodine Deficiency through USI: The making of a Global Public Health Success Story – The First Decade (1985-1995). SCN News no 35 end -2007; 9-10
13. WHO Technical Report Series. Infants and Children. PHYSICAL STATUS: THE USE AND INTERPRETATION OF

ANTHROPOMETRY .Reports of a WHO Expert Committee. 855; 165

14. Ermans AM, Kinthaert J, Van der Veldenn,Bourdoux P, Studies of the antithyroid effects of cassava and thiocynate in rats . In: Ermans AM, Mbulamoko NM, DelangeF. et al. eds. Role of cassava in the etiology of endemic Goitre and Cretinism. Ottawa: International Development Research Centre, 1980; 93

15. NUT 403 Report on Market Survey conducted in Basorun and Oje Market and Food and Nutrition Survey conducted by Group 1 in Winners church Area in Ibadan North East Local Government of Ibadan Oyo State Nigeria. Lecturer in charge; Prof. Akinyele assisted by Mrs. Unuigbe. University of Ibadan. Nigeria. June 2009.

Table 1 Prevalence of Iodine deficiency of all children surveyed

<20	Severe iodine deficiency	0%
20-49	Mild iodine deficiency	1.6
50-99	Mild iodine deficiency	29.2
100-199	Optimal	39.1
200-299	More than adequate	29.7
<300	Possible excess	0.5

Table 2 Prevalence of Iodine deficiency of all the children by school

School	N	Severe deficiency	Moderate deficiency	Mild deficiency	Optimal	More than adequate	Possible excess
		%	%	%	%	%	%
Local Authority (Public-Urban)	48	___	4.2	20.8	43.8	31.3	___
Baptist Ajaba (Public-Rural)	48	___	___	31.3	29.2	39.6	___
Baptist (Private-urban)	48	___	2.1	25.0	52.1	18.8	2.1
Camila (Private-urban)	48	___	___	39.6	31.3	29.2	___

Table 3 Urinary Iodine Excretion of all the children by sector

Schools	Mean µg/L	Median µg/L	Minimum µg/L	Maximum µg/L
Local Authority (Public-Urban)	152.98 ± 9.74	157.00	38.00	283.00
Baptist Ajaba (Public-Rural)	156.96 ± 10.38	155.00	53.00	275.00
Baptist (Private-Urban)	142.65 ± 9.34	125.00	38.00	310.00
Camila (Private-Urban)	142.48 ± 10.12	121.50	52.00	270.00

Table 4 Urinary Iodine Excretion; NFCNS 2001-2003 and Ila LGA 2009

	N	Severe deficiency	Moderate deficiency	Mild deficiency	Optimal	More than adequate	Possible excess
		%	%	%	%	%	%
Osun State NFCNS 2001-2003	272	1.5	8.5	15.8	29.8	17.7	26.8
Ila Local Government 2009	192	0	1.6	29.2	39.1	29.7	0.5

Table 5 Prevalence of goitre by sex, sector and type of school

N=574	M%	F%	Rural%	Urban%	Private%	Public%	Total
Not visible Not palpable	47.7	51.4	22.8	76	41.1	57.7	98.8
Not visible But palpable	0.3	0.9	0.2	1.0	0.9	0.3	1.2

Table 6 prevalence of undernutrition among the children surveyed

Indices	± 2SD		< - 2SD		< - 3SD	
	Frequency	%	Frequency	%	Frequency	%
Stunting	465	81.9	72	12.7	31	5.5
Underweight	482	84.1	48	14.7	7	1.2
Wasting	464	92.8	28	5.6	8	1.6

Table 7 Percentage prevalence of stunting, underweight and wasting among surveyed children in Osun state and Ila local government

		Mild <-1SD %	Moderate <-2SD %	Mild-moderate <-2SD %	Severe <-3SD %
Stunting	Osun state	29.7	17.4	-	12.5
	Ila	-	-	12.7	5.5
Underweight	Osun state	40.3	16.8	-	2.6
	Ila	-	-	14.7	1.2
Wasting	Osun state	25.3	4.6	-	1.3
	Ila	-	-	5.5	1.6

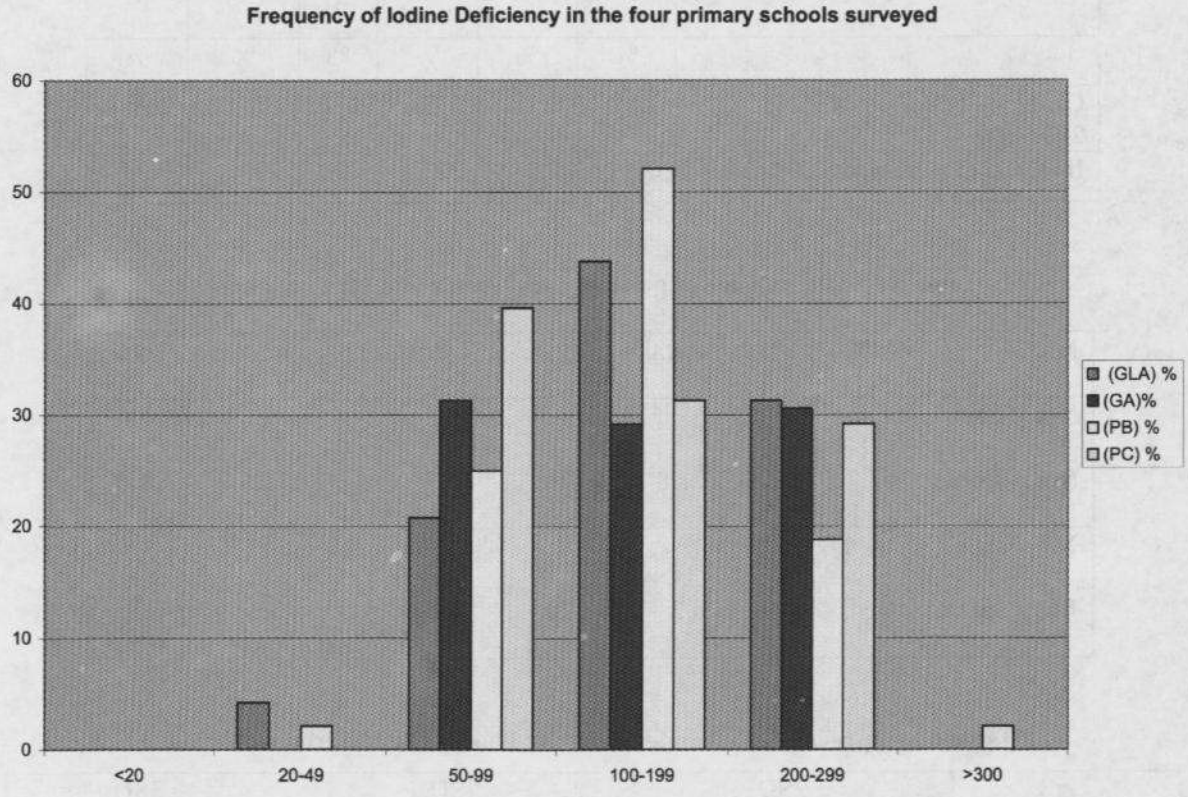
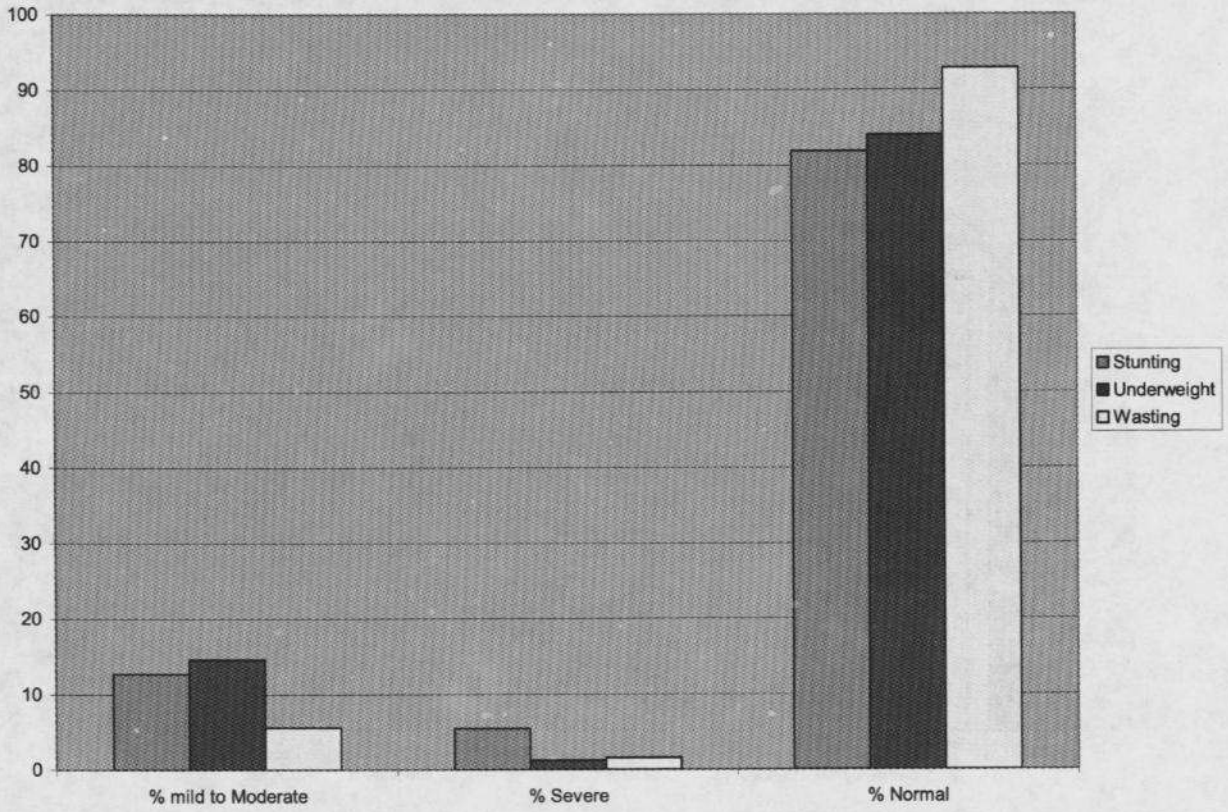


Fig 1 Urinary Iodine Excretion of the children surveyed



Prevalence of iodine Urinary Excretion in rural and urban

	N	Severe deficiency	Moderate deficiency	Mild deficiency	Optimal	More than adequate	Possible excess
		%	%	%	%	%	%
Rural	48	___	___	31.3	29.2	39.6	___
Urban	144	___	2.1	28.5	42.4	39.5	0.7

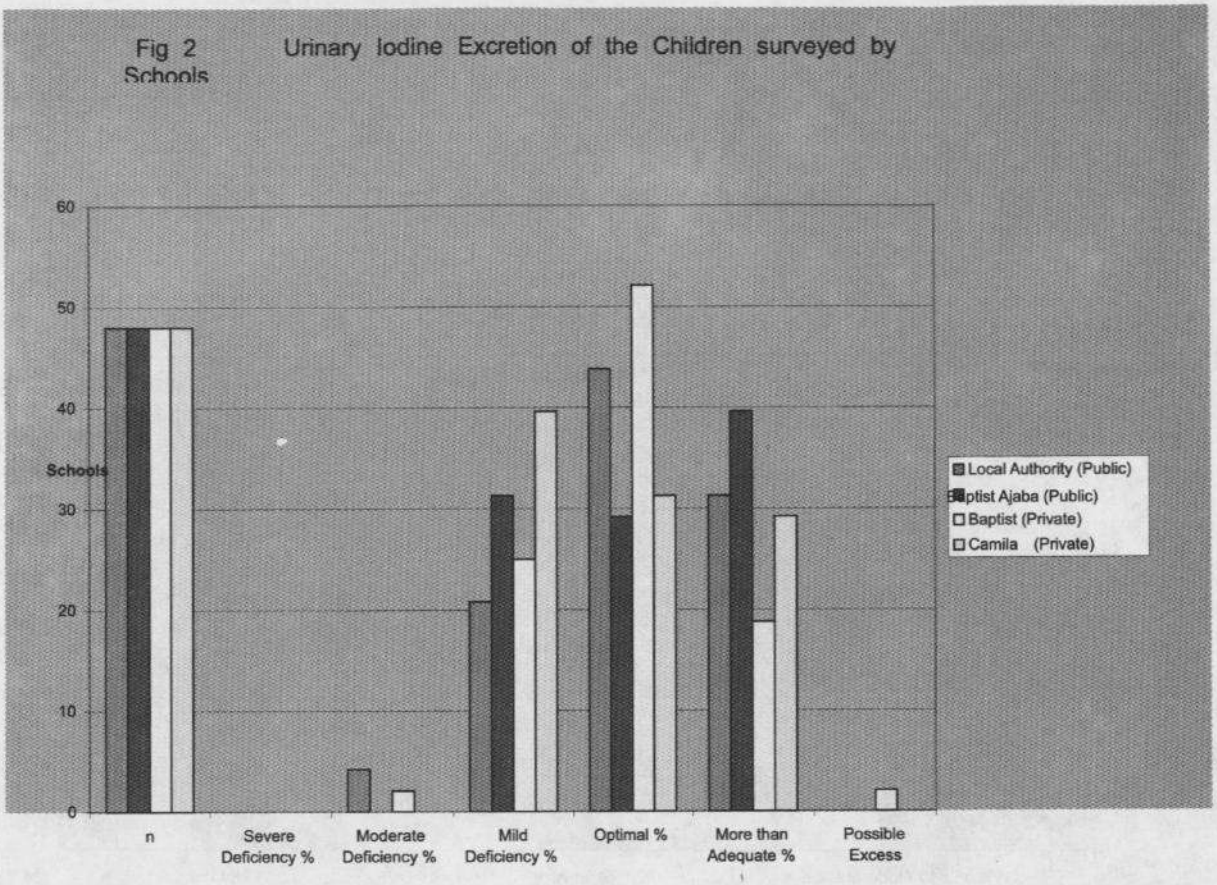


Fig 2 Urinary Iodine Excretion of the Children surveyed by Schools
60
50
40
30
20
10
0
Schools
n
Severe Deficiency %
Moderate Deficiency %
Mild Deficiency %
Optimal %
More than Adequate %
Possible Excess
Local Authority (Public)
Baptist Ajaba (Public)
Baptist (Private)
Camila (Private)