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Descriptive Study of School Feeding Practices in Nigerian Children and the Risk of Dental Caries

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Authors' contributions

This work was carried out in collaboration between both authors. Author JOE designed the study, performed the statistical analysis, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Author NKO performed statistical analysis and managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Nutrition is important in development, growth and maintenance of overall well being of an individual and plays a significant role in children's cognitive, behavioural and emotional development. Poor diets may initiate or exacerbate chronic diseases including dental caries which has dietary fermentable carbohydrates as one of its aetiologies.
Objectives: To describe the school feeding practice in Nigerian schools and relate the contents of their lunch boxes to risk of having dental caries and determine the relationship between socioeconomic factors and the content of lunch boxes.
Study Design: This was a descriptive cross sectional study.
Methodology: Multistage sampling technique was used in selecting participants from 12 schools in Southern Nigeria. Information on socio-demographic characteristics and contents of lunch boxes were elicited using structured questionnaires. The contents of lunch boxes were categorized as balanced (cooked meals with vegetables or fruits), overloaded (one cooked meal and snacks) and unbalanced-over loaded (no lunchbox, or greater than one snacks). Information elicited were analyzed using SPSS version 22 and the level of significance was set at ≤ 0.05.

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Results: There were 152 (49.8%) males and 153 (50.2%) females with a mean age of 10.1 (±2.2) years who participated in the study. One hundred and fifty two (49.8%) pupils brought lunch boxes to school. The category of meals taken during lunch breaks was mostly [157 (51.5%)] unbalanced-overloaded. There were statistically significant associations between the mothers' occupation (<0.001), number of siblings (p<0.001), type of school (p=0.001) and the presence of lunch boxes. There was also statistically significant association between the types of schools and contents of lunch packs. Multivariate regression analysis showed that age (OR=0.116, CI=0.030-0.447; p=0.002) and number of siblings (OR=0.286; CI=0.097-0.841; p=0.023) were significant predictors of bringing lunch box to school.

Conclusion: Type of school, age of the children, their mothers' social class/occupation and family size were significantly associated with possessing lunch packs. Their lunch meals were majorly confectioneries thus a high risk to dental caries.

Keywords: School health; school feeding; lunch packs; Nigerian children; dental caries.

1. INTRODUCTION

Nutrition is important in development, growth and maintenance of overall well being of an individual [1] and plays a significant role in children's cognitive, behavioural and emotional development [2]. A child spends six to eight hours a day in school and therefore needs to have lunch (meal) while in school. For this reason the school meal should be at least one third of the daily requirement of both the major and minor nutrients comprising carbohydrates, protein, dairy products, cereals and leafy vegetables/fruits [3,4]. Nutritious and balanced meals provide tissue protective function when taken in the right form and consistency.

On the contrary, unbalanced foods may initiate or exacerbate chronic diseases such as malnutrition, obesity, cancers, diabetes and heart diseases [5-8]. Certain meals in excess or deficiency in nutrients have been implicated in oral diseases such as dental caries, periodontal diseases, oral ulcers, enamel developmental defects, dental erosion, orofacial gangrene (Noma) and exacerbating infections [9]. Dental caries, the commonest chronic disease affecting children, has fermentable dietary sugars as one of its multifactorial aetiology. These dietary sugars are low molecular weight carbohydrates that are highly cariogenic and are frequently found in confectioneries or junk foods [10].

The school feeding service is a universal programme designed to promote education and good health in vulnerable children. In Nigeria, the school feeding service is one of the five thematic areas of the school health programme which fulfils the goal of universal basic education [4,11,12] while ensuring good health and community development [4,12]. Although school feeding has been implemented in some States in Nigeria, children attending schools not involved in school feeding programmes still bring lunch packs to schools or buy food within the school premises. Usually, caregivers/parents pack lunch for children and these meals should contain adequate nutrients but studies have shown that the lunch packs taken to schools contained poor quality food [6,8,13-15]. It has been reported that children's nutrition is influenced majorly by their parents, "whose biologic factors (hunger, appetite, taste), economic (cost, income availability), physical (access, education, skills in cooking, time), social (culture, family, peers), psychological (stress, mood), attitude, belief and knowledge about food," translates to their children [16,17].

Therefore the objectives of this survey were (i) to determine the contents of lunch boxes and foods purchased within the school environment in Southern Nigeria and relate these to risk of dental caries. (ii) Also, the relationship between socioeconomic factors (mother's level of education, occupation), number of siblings and school feeding practices (presence/absence and content of lunch boxes) in the children was assessed.

2. METHODOLOGY

Ethical clearance was obtained from the Ethics committee of the University of Port Harcourt Teaching Hospital (UPTH/ADM/90/S.II/VOL.XI/ 423). Permission was obtained from the State Universal Basic Education Board (SUBEB) of Rivers and Enugu States, head teachers and Proprietors (private schools).Consent was also obtained from caregivers/parents of the children while assent was obtained from school pupils.

2.1 Study Design and Sampling Technique

The sample size was determined using the formula [18]:

$$n = z^2 pq / d^2$$

Where, n= sample size, z = confidence interval at 95%=1.96, p = the proportion in the target population estimated to have a particular characteristic (lunch pack), p=77% [13],

q = (1-p) and d = degree of accuracy desired, was set at 5%.

This translates to: $n = 1.96^2 \times 0.77 \times 0.23/0.05^2 = 272$

The minimum sample size was 272;

When 20% was added to compensate for non response (attrition), sample size for was 327.

Prior to the visits, four research assistants (dentists) were trained to coordinate the children and to fill the parameters in the questionnaires. A multistage sampling technique was used in selecting 360 participants from 12 schools in two States (Enugu and Rivers) located in two Geopolitical regions (South South and South East) in Nigeria. Three public and three private schools were selected in each state. These were selected to have a good representation of the school pupils. The research tool for this study was a structured questionnaire [Appendix I] which was interviewer administered to the selected pupils. The study was non-invasive and the names of the schools and pupils were excluded from the data.

2.2 Data Collection

Data collection was done by two paediatric dentists in the different (2) states of the country. The first part comprised of questions on socio-demographic characteristics while the second part consisted of questions on information on possession of lunchbox and its content, The socio-demographic information obtained included; age as at last birthday, sex and parents occupation. There were diverse occupations, so the parents' occupations were further classified into levels of skills using the International Standard Classification of Occupations by International Labour Organisation [19]:

a. Skill level 1 (Social class 1) = Jobs requiring physical strength and endurance such as office cleaners, gardeners, labourers and kitchen assistants.
b. Skill level 2 (Social class 2) = Requires high level of manual dexterity, advance literacy, numerical and communication skills such as drivers, police officers, hairdressers, secretaries and traders.
c. Skill level 3 (Social class 3) = Involves complex technical and practical skills such as shop managers and technicians.
d. Skill level 4 (Social class 4) = Complex solving and decision making such as school teachers, medical practitioners, civil engineers, computer analysts and nurses.

2.2.1 Description of the content of the lunch box

When the presence of the lunch boxes was ascertained, the contents of the lunch boxes brought by the participants were noted and further determined using the lunchbox categories developed by Kelly et al. [20] by the trained assistants.

The lunch boxes were categorized [20] as:

1. Balanced- Home cooked food with vegetables, fruits.
2. Overloaded- i. Home cooked food with more than 1 extra food (snacks).
3. Unbalanced and overloaded –when there was no lunchbox, or presence of snacks.

The drinks were categorized into water, milk and extra drinks, [15] the extra drinks comprised the sugar containing drinks such as fizzy drinks, sodas, sweetened yoghurts and fruit flavoured drinks.

2.2.2 Data analysis

The information collected was entered into data spreadsheet and analysed using the IBM Statistical Package for the Social Sciences (SPSS) Illinois, version 22. Descriptive statistics was used to describe school feeding practices and the contents of the lunch boxes. The content of lunch boxes of children in public schools and private schools was compared using Pearson's chi square test. Regression analysis was carried out to determine the predictors of bringing lunch box to school. Statistical significance was set at $p \leq 0.05$.

3. RESULTS

There were 152 (49.8%) males and 153 (50.2%) females with a mean age of 10.1 (±2.2) years. Twenty nine (9.6%) and 46 (15.1%) of their fathers' and mothers', respectively were unemployed, majority of the parents were skill level two(Social Class 2) details in Fig. 1.

Some of the pupils (0.3%) had up to ten siblings; majority (24.3%) had four siblings.

However, when they were grouped, those that had no siblings were 14 (4.6%), 65 (21.3%) had 1 or 2 siblings, 135 (44.3%) had 3 or 4 siblings and 91 (29.8%) had more than 4 siblings. Details in Fig. 2.

3.1 The Proportion of Pupils in Possession of Lunch Boxes and the Contents

One hundred and fifty two (49.8%) pupils brought lunch boxes to school regularly; 63(41.4%) brought cooked meals, 56 (36.8%) brought confectioneries and 33 (21.7%) had lunch boxes of both cooked meals and confectioneries. Eighty nine (63.6%) brought water in their lunch boxes, while 3 (2.1%) brought milk and 48 (34.3%) had sweetened fruit drinks and fizzy drinks.

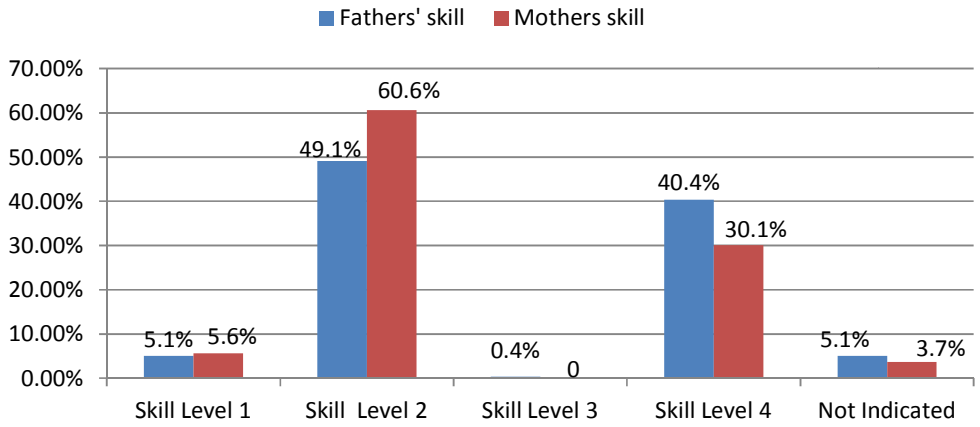

Fig. 1. Parents' occupational status/levels of skills of the parents' of the subjects

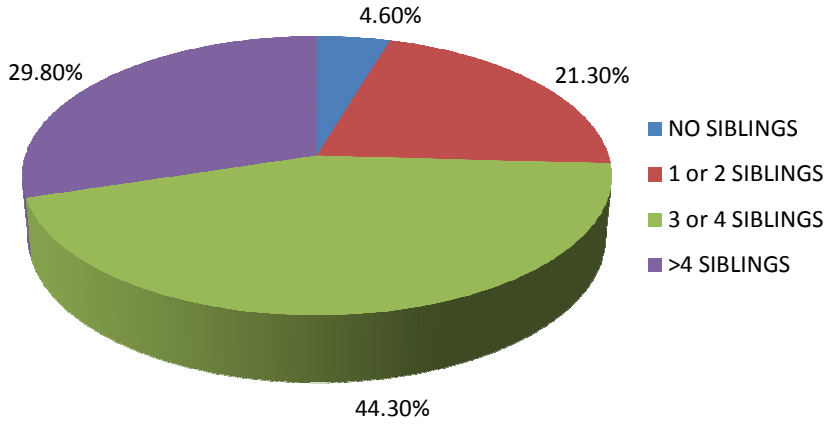

Fig. 2. The distribution of siblings among the participants

Table 1. Association between study participants' age, sex, mothers' skill and possession of lunch box N = (305)

Variables	Possession of lunch box			
Age group(years)	**Yes N=152(100.0)**	**No**	**Total**	**P value**
5 to 7 years	45(29.6)	0(0.0)	45(14.8)	
8 to 9	50(32.9)	20(13.1)	70(23.0)	
10 to 11	36(23.7)	68(44.4)	104(34.1)	
12 and above	21(13.8)	65(42.5)	86(28.2)	<0.001*
Sex				
Male	70(47.0)	82(52.6)	152(49.8)	
Female	79(53.0)	74(47.4)	153(50.2)	
	149(100.0)	156(100.0)	305(100.0)	0.33
No of siblings				
None	11(7.2)	3(2.0)	14(4.6)	
1 to 2	40(26.3)	25(16.3)	65(21.3)	
3 to 4	72(47.4)	63(41.2)	135(44.3)	
More than 4	29(19.1)	62(40.5)	91(29.8)	<0.001*
Skill of mother				
1	3(2.0)	13(8.5)	16(5.2)	
2	78(51.3)	85(55.6)	163(53.4)	
4	56(36.8)	25(16.3)	81(26.6)	
Unemployed	15(9.9)	30 (19.6)	46(15.1)	<0.001*

**p<0.05 is significant*

Table 2. Association between subjects' sex and the content of their lunch boxes

Lunch box and its content	Males	Females	Total	p value
†Content of lunch box				
Cooked food	40 (57.1)	53 (67.1)	93 (51.4)	
Confectioneries	48 (68.6)	40 (50.6)	88 (48.6)	0.06
Drink in lunch box				
Water	44 (65.7)	45 (61.6)	89 (63.6)	
Milk	1 (1.5)	2 (2.7)	3 (2.1)	
Juices/fizzy /soda	22 (32.8)	26 (35.6)	48 (34.3)	0.81
Category of meal				
Balanced	13 (8.6)	22 (14.4)	35 (11.5)	
Over loaded/ food & snacks	57 (37.5)	56 (36.6)	113(37.0)	
Unbalanced-Over loaded	82 (53.9)	75 (49.0)	157 (51.5)	0.27

† 33 participants had both types of meals in lunchbox

One hundred and thirty one (43%); 68 (44.7%) of the males and 63 (41.2%) of the females [p=0.30] bought confectioneries and food within and outside the school compound from food vendors, for their lunch break. Majority (51.5%) were under the category of unbalanced-overloaded meal type (i.e. snacks or no lunch packs), 113 (37.0%) had overloaded and 35 (11.5%) had balanced meals.

3.2 Association between Study Participants' Age, Sex, Mothers' Skill and Possession of Lunch Box

The more the number of siblings the less likely they were to bring lunch packs to schools. There was a significant relationship (p=0.00) between the number of siblings and the presence of lunch boxes/packs. There was a significant association (p<0.001) between the mother's occupation and the presence of lunch boxes and the contents of the boxes. See Table 1 for details.

3.2.1 The relationship between the sex of the participants and contents of lunch boxes

There were no statistically significant associations between sex and the content of the lunch boxes. Sixty seven percent of females brought cooked food to school while 68.6% of males brought confectioneries/snacks to school. See details in Table 2.

Table 3. The association between socio-demographic characteristics and the categories of meals

	Categories of lunch meals			Total
	Balanced	Overloaded	Unbalanced-overloaded	
Sex				
Males	13 (8.6)	57 (37.5)	82 (53.9)	152 (49.8)
Females	22 (14.4)	56 (36.6)	75 (49.0)	153 (50.2)
				Y^2 2.632; 0.27
Skill levels of fathers				
One	0 (0)	2 (22.2)	9 (77.8)	11 (4.4)
Two	16(11.8)	44 (32.4)	76 (55.9)	136 (54.4)
Three	0 (0)	1(100)	0 (0)	1 (0.4)
Four	13 (12.7)	54 (52.9)	45 (44.1)	102 (40.8)
				Y^2 13.162;0.11
Skill levels of mothers				
One	1 (6.7)	1(6.7)	13 (86.7)	15 (5.8)
Two	22 (13.5)	54 (33.1)	87 (53.4)	163 (62.9)
Three	0	0	0	0
Four	9 (11.1)	46 (56.8)	26 (32.1)	81 (31.3)
				Y^2 24.528, <0.01*
Type of school				
Private	18 (16.2)	79 (71.2)	14 (12.6)	111 (36.4)
Public	17 (8.8)	34 (17.5)	143 (73.7)	194 (63.6)
				P<0.001*

**p<0.05 is statistically significant*

Table 4. The association between the types of schools and possession/content of lunch boxes of the subjects

	Types of schools		p value
	Private n (%)	Public n (%)	
Possession of lunch box			
Yes	97 (87.4)	52 (26.8)	<0.001*
No	14 (12.6)	142 (73.2)	
Type of food			
Cooked	19 (19.8)	41 (78.9)	<0.001*
Snacks	44 (45.8)	11 (21.1)	
Both types	33 (34.4)	0 (0)	
Type of drink			
Water	58 (67.4)	31 (57.4)	0.36
Milk	1 (1.2)	2 (3.7)	
Juice/fizzy/sweetened yoghurt	27 (31.4)	21 (38.9)	
Meals Purchased in school			
Yes	10 (9.0)	121 (62.4)	<0.001*
No	101 (91)	73 (37.6)	
Categories of food			
Balanced	18 (16.2)	17 (8.8)	<0.001*
Overloaded	79 (71.2)	34 (17.5)	
Unbalanced-overloaded	14 (12.6)	143 (73.7)	

**p<0.05 is statistically significant*

3.2.2 The association between socio-demographic characteristics and the categories of meals

There were no statistically significant associations between socio-demographic factors such as sex and fathers' skill levels and the categories of lunch meals however there were significant associations between skill levels of mothers', types of schools and the categories of lunch meals. See Table 3.

3.2.3 The association between the types of schools and possession/content of lunch boxes of the subjects

There were statistically significant associations between the types of schools and presence/absence of lunch boxes, contents of lunch boxes ($p<0.001$), however there was no statistically significant difference in the type of drinks taken to schools ($p=0.36$) depicted in Table 4.

3.3 Logistic Regression of Factors Associated with Being in Possession of Lunch Boxes

The logistic regression model showed that the type of schools and age of the pupils can be used to predict ($p< 0.05$) the probability of bringing a lunchbox to school. The private school pupils are more likely to bring lunchbox to school with an odd ratio of 7.8 (95%C.I, 3.55 -17.14) compared to the public school pupils. Likewise the younger age groups are more likely to bring lunchbox with an odd ratio of 1.34 (95%C.I 1.10-1.63) compared to the older age groups.

3.3.1 Logistic regression of factors associated with type of food (Snack/cooked food) put in the lunch box

Table 6 shows that there was 89% decreased odd for children aged 5 to 7 years to bring snacks to school when compared to children

Table 5. Logistic regression of factors associated with being in possession of lunch boxes variables in the equation

Characteristics	B	S.E	Wald	df	p-value	OR	95% C.I for OR	
							Lower	Upper
Mothers' occupation	0.015	0.126	0.015	1	0.903	1.015	0.793	1.300
Type of school	2.054	0.402	26.155	1	0.000	7.801	3.550	17.142
Age of pupil	0.293	0.099	8.732	1	0.003	1.340	1.104	1.627
Number of siblings	0.075	0.081	0.865	1	0.352	1.078	0.920	1.262
Constant	-6.743	1.020	43.730	1	0.000	0.001		

OR = Odds ratio

Table 6. Logistic regression of factors associated with contents of lunch boxes (Snack/cooked food)

Variable	N%	Multivariate adjusted OR	95% CI	P value
Age group(years)				
5- 7	45(29.6)	0.116	0.030-0.447	0.002
8 - 9	50(32.9)	0.282	0.079-1.012	0.052
10 - 11	36(23.7)	0.522	0.143-1.912	0.327
12 and above	21(13.8)	1		
No of siblings				
None	10(6.6)	0.282	0.057-1.403	0.122
1 to 2	40(26.5)	0.717	0.220-2.340	0.582
3 to 4	72(47.7)	0.286	0.097-0.841	0.023
More than 4	29(19.2)	1	1	
Skill of mother				
1	3(2.0)	2.803	0.157-50.074	0.483
2	78(51.3)	1.608	0.418-6.184	0.490
4	56(36..8)	0.755	0.185-3.088	0.696
Unemployed	15(9.9)	1		
Total	152(100.0)			

aged 12 years and above and this was statistically significantly (P=0.002). Less number of children aged 5 to 7 years will bring snacks to school when compared to those aged 12 years and above.

Also, there was 71% decreased odd for children with 3 to 4 siblings to bring snacks to school when compared to those with more than 4 siblings(P=0.023). Less number of children with 3 to 4 siblings will bring snacks to school when compared to those with more than 4 siblings.

4. DISCUSSION

In the present study, the type of school had an influence on their possessing lunch boxes, this finding was also reported on school children in Nnewi, Nigeria [13]. It was also observed that a little over half of the school children studied did not have lunch boxes. This was significant when the private and public school pupils were compared. The private school pupils were more likely to bring lunchboxes to schools when compared to the public school pupils. This may be because pupils who attend private schools come from families that are more financially stable than the families of children who attend public schools [21].

Only few children had balanced meals in their lunch packs according to the food categories developed by Kelly et al. [20]. Although most of the private school pupils had lunch packs, the contents were majorly (snacks) confectioneries. However many children in public schools who brought lunch packs to school had cooked food. It is generally accepted that the type of school a child attends is a reflection of the socioeconomic status of the family. We may therefore deduce that those of higher socioeconomic class encouraged cariogenic diets. This finding corroborates the report by Drewnowski and Darmon, [22] where women of low and high incomes were given additional funds to purchase food. It was observed that women of low income purchased healthier foods while the converse was observed among those with high incomes; they purchased less healthy meals. In this study, more than half that of the children from public schools bought food/confectioneries during break as against 9% private school children. It can be inferred that whether lunch packs were brought from home or purchased from food vendors a large proportion of the children are at risk of dental caries. Confectioneries are a risk to dental caries since they consist of free fermentable sugars.

In this study, the younger age groups were more likely to bring lunchbox compared to the older age groups as reported in previous studies [13,14,15,23]. The older children were more likely to bring snacks to school than younger ones probably because they can handle cash more than the younger ones and parents may also feel that the older children can sort themselves out when given money. In addition, the abovementioned studies had reported that older children probably preferred tasty cariogenic meals.

Again, children with more than four siblings will bring snacks, which are energy dense but of low nutrient value to school more than other children probably because their parents may not have time to prepare food as well as prepare the children for school in the morning. Our finding buttresses what was documented in school children in Nnewi, Nigeria where family size was reported to have a significant relationship to the meals children taken to schools [13]. Also, with the economic crisis and recession, women in modern times are employed and may have less time to devote to cooking and feeding children, [24] this was further given credence by the finding in this study, where only 15.1% of the mothers' were full time housewives. It was observed that the skill levels/occupation of mothers' were significantly associated with the children possessing lunch boxes and the contents of lunch boxes. This corroborates what has been reported on the level of education/social class of mothers' having an influence on what their children eat [16,17]. They resort to giving their children snacks and this practice is a risk to developing dental caries because snacks (confectioneries) are cariogenic.

However, when the gender was considered, there were no statistically significant differences between the males and females possessing lunch packs/boxes, however over two thirds of the females that took lunch boxes to school brought cooked foods the converse was the case for males where over two thirds of those that had lunchboxes had confectioneries.

5. CONCLUSION

Type of school, age of the children, their mothers' social class/occupation and family structure were determinants of school children

who possessing lunch packs. They were also the determinants of contents of their lunch meals. Majority of the pupils bought confectionaries for consumption in the school irrespective of whether they brought lunch boxes or not. Bad dietary habits inculcated at a young age if unchecked may have dire consequences on the oral health as well as the general health of children. There is a need to educate parents/caregivers on the benefits of packing nutritionally beneficial lunch for their school children. School feeding services in both private and public schools can be implemented to address common risk factors of dental caries and systemic problems. Laws banning the sales of cariogenic diet around school premises may also be promulgated.

CONSENT AND ETHICAL APPROVAL

Ethical clearance was obtained from the Ethics committee of the University of Port Harcourt Teaching Hospital (UPTH/ADM/90/S.II/VOL.XI/ 423). Permission was obtained from the State Universal Basic Education Board (SUBEB) of Rivers and Enugu States, head teachers and Proprietors (private schools). Consent was also obtained from caregivers/parents of the children while assent was obtained from school pupils.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX I

Descriptive study of the Contents of the lunch boxes of primary school pupils

Part 1:

1. **Sex:** Male…….. Female……..
2. **Age:** (as at last birthday)……
3. **Father's occupation:** ..... **Mother's occupation:** .....
4. **Educational level:** Father's primary....., secondary....., tertiary.....
5. **Educational level:** Mother's primary....., secondary....., tertiary.....
6. **Number of siblings:** .....

Part 2:

7. **Do you have a lunch box:** Yes…… No……..

If yes to question 7

8. **Who packed the lunch box:** .....

Type of food/drinks	Yes/No	Type (list)
Food		
Cooked food		
Bread		
Fruits/Vegetables		
Biscuit		
Cereals		
Popcorn		
Chocolate/Sweets/toffees		
Snacks		
Others not listed		

Type of food/drinks	Yes/No	Type (list)
Liquid		
Water		
Milk/beverages (milo,bournvita)		
Fizzy drink (soft drinks)		
Juice		
Other drinks (not listed)		

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