

Article

Analysis of The Number and Weight School Bags of Primary School Children in Rivers State, Nigeria

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Abstract: School bags play a vital role in the school system. They help the children keep their learning materials together and safe, and also provides a means of transporting them to school. A recent encounter with a 9-year-old whose textbooks alone weighed 10kg triggered the need to investigate if heavy bag weights is a one-off occurrence or prevalent in the educational system. This study which had Port Harcourt Metropolis as its study area sought to find out how many bags primary school children in Rivers State took to school, the weight of their school bags and what type of school bags they carried. The findings were that majority (84%) of the 1001 children went to school with more than one bag, some having as many as 4 bags; 64% had bags that were above the recommended 10% of their body weight, with some being as much as 50%; majority of the children had backpacks for school bags. The study recommended a deliberate policy to restrict this prevalence the weight of school bags by the government; find out which the children's bags are so heavy and carry out mediation on children whose health might be affected by the weight of the bags.

Keywords: School Bag Weight, Primary Schools Pupils, Technological Gadgets, Laptops, Tablets, Average Bag Weight

1. Introduction

The beginning of every school year is usually marked by a frenzy of parents, especially mothers in Nigeria, getting back-to-school supplies for their children returning to school and new school supplies for beginning students. In doing this, one of the highlights for parents and children is getting a suitable schoolbag[1]. School bags are bags used by school children to carry their school supplies. They are used to transport their belongings to and from school on a daily basis. A suitable school bag differs from one person to the other. What is suitable for one person might not be suitable for another person. When we are talking about something being suitable for the user, we are in the field of ergonomics[2].

In the past few years, there has been a lot of research and literature on ergonomics in schools generally, and the issue of backpacks of school children worldwide[3]. Although there has not been much study on this issue in the Nigerian school system, there have been complaints from parents about how heavy the school bags children carry to school are. The magnitude of this complaint and the concern of the parents hit home recently when a neighbour's 9-year-old son in Primary 4 was seen going to school with a wheeled travelling bag. The thought that came to mind was that the child was going on a school trip and so this researcher asked him where he was travelling to. The father of the boy, who was a medical doctor had a good laugh and explained he had to buy the travelling bag with

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wheels as his school bag because his previous school bag was too heavy for him to carry. This generated interest in this research. This interest led to getting a scale to weigh the child's school materials. To the surprise of this researcher, only the textbooks in the bag weighed 10kg or 20lbs (Fig.1a). These were just the 19 textbooks. 3 of the books shown in Fig.1c below had over 600 pages. The bag still contained 12 exercise books, a water bottle, stationeries and his lunch box. It compelled this researcher to take a closer look at the school bags children in the neighbourhood carried, how they carried and how many bags they carried. This interest culminated in going beyond the neighbourhood to carry out this study.



Figure 1a. The scale showing the wight of the textbooks seen in the 9year-old's Schoolbag.

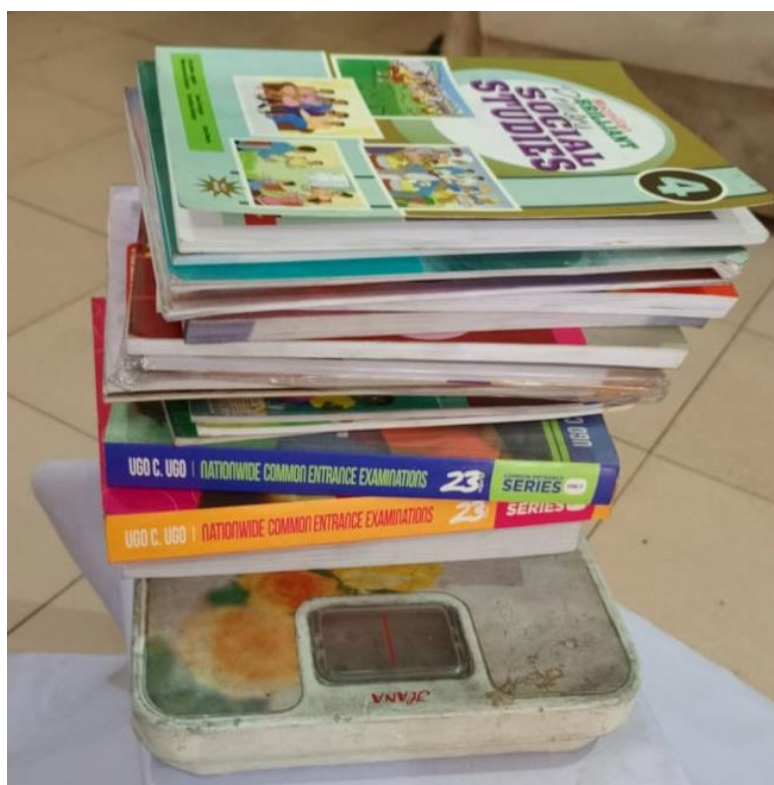


Figure 1b. Textbooks in a 9year-old Primary 4 child's School bag.

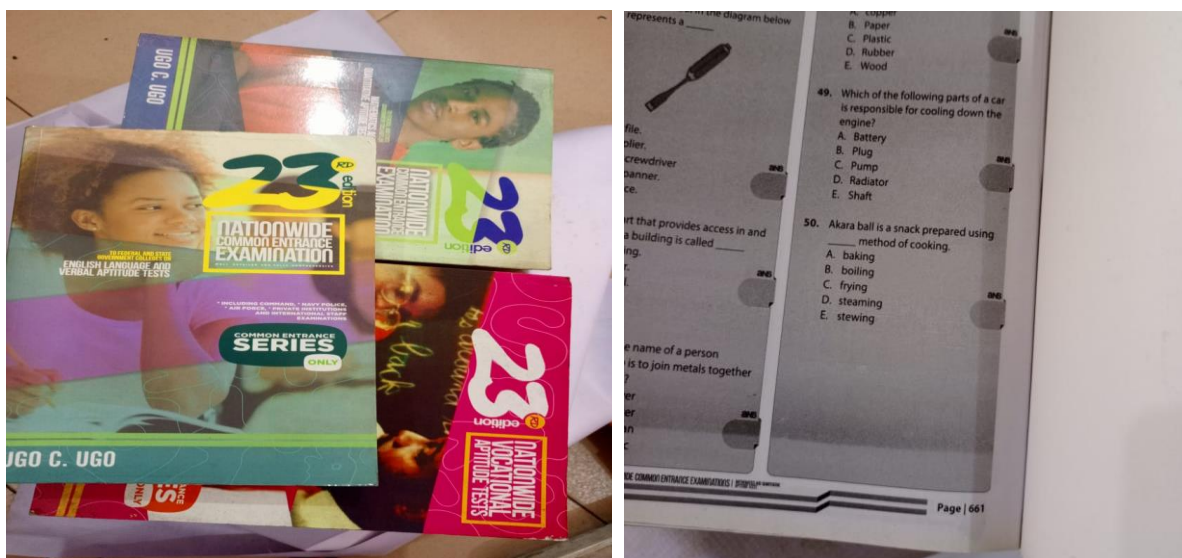


Figure 1c. 3 books of over 600 pages seen in a 9year=old's Schoolbag.

School bags are bags used by school children to carry their school supplies. They are used to transport their belongings to and from school on daily basis. They are bags used to carry textbooks, exercise books, workbooks, pens, lunch boxes, water, homework, gym clothes, and all class folders/binders. With the development of technological gadgets, what these bags carry has continued to expand. These bags are now also used to carry things like laptops, tablets, charging cords, phones, and so on[4]. Thus, a good or suitable school bag must adapt to the needs of school children and is spacious enough to accommodate all the school supplies imposed on the child by the school[5].

School bags are very important in the school system. They are an essential part of the educational system because of the many functions it is used for. Some of these functions are as follows:

- a. They are used to transport different materials needed in the school system.
- b. It helps the child keep his belongings safe from external damage like the sun, dust, rain, etc.
- c. It helps to keep the school materials together.

To carry out these functions effectively in a world where the school supplies keep increasing, especially in a developing country where education is seen as the way out of poverty and access to a better life, parents and children need bags that can keep their children's things together and intact. This constantly leads to overloading of the bags. In doing this the children are made to constantly carry about bags that are very heavy for their fragile bodies. Carrying heavy loads is detrimental to the health of the children. Some of these are the following:

- a. Increased risk of developing neck and back pain.
- b. It has effect on the physical balance, thereby increasing the risk of falls and other injuries
- c. Discomfort from learning forward to compensate for the heavy weight of the bags
- d. Sore shoulder and spine from the strap of the bags
- e. It causes unnatural and uncomfortable spinal position and postures in the children as a result of long use
- f. It makes children lean to one side to offset the excess weight for people who carry their bags on one shoulder or the hand
- g. Prevent posture distortion and tense muscles[6].

To prevent such debilitating outcomes in the children, it is necessary to have school bags that are appropriate. Having an appropriate school bag is important because even a day of carrying a bag that is too heavy is too much. A situation where the children carry these bags daily for several years can be better imagined[7]. An appropriate school bag should have the following features:

- a. Not more than 10% of body weight
- b. Worn around both shoulders
- c. Worn below the shoulder but above the hips
- d. Must be worn around the shoulders and use the chest and hip strap to take pressure away from the shoulder
- e. No wider than the body of the user.
- f. Must have multiple compartments to help distribute load[8].

The criteria for appropriateness of school bag that seem to attract the most attention and controversy is the one that has to do with the weight of the school bag. There have been various opinions of what constitutes appropriate or overloaded school bag. Some authors have asserted that the most appropriate backpack/school bag weight is 5-10% of the child's weight, sticking to 10% as the maximum weight a child should carry[9]. Some of those who have expressed this opinion are the National Safety Council of America, La boutique des toons, the American Academy of Pediatric, Moore et al, Gohain, and Bal Bharati Public. They suggest that the universally accepted bag weight is not more than 10% of body weight. Azerf and Lavigne are of the opinion that 15% of body weight should be the maximum for body weight. Still some others have expressed the opinion that 20% of body weight is alright for children. In this group falls Gilray and Seguras. However, Pugle and La boutique des toons clarified that children can carry up to 20% of their body weight if only their school bag is a trolley bag with wheels. Thus, for the purpose of this study the universally accepted bag weight of 10% of the child's body will be used for the study since Nigeria does not have a stipulated percentage[10].

Review of Empirical Study on School Bags

Forjuoh et al carried out a study on the percentage of body weight carried by students in their school bags. The study was a cross-sectional survey on 3 elementary schools in Texas. It was carried out on pupils who ranged from kindergarten to the 5th grade. The result revealed an increase in school bag weight percentage as the grades increased. The mean backpack weight went from 6.2% among kindergartens to 12% among 5th graders. The result also revealed that only 26% of the children had backpacks that were of the recommended weight of 10%. This means that the remaining 74% of the children were carrying school bags that were not appropriate for their body weight[11].

Forjuoh investigated the school backpack weight of students in Ghana, Guatemala and the United States of America. The study had the objectives of finding out the percentage of body weight the children and determining if the parents were aware of the school bag weight and content of their children. The result showed that the mean schoolbag weight for Ghana, Guatemala and the USA were 7.7%, 9.7% and 9.4% respectively. This showed that Ghana had the smallest percentage of schoolbag weight while the USA had the highest percentage. The majority of the parents in all the 3 countries knew the content of their children's school bags. It was 73.6% for Ghanaian parents, 57.3% of Guatemalan parents and 55.3% of parents in the USA. The parents, however, failed woefully in their knowledge of the stress their children were going through every day, as only 4.1% of Ghanaian parents, 21.9% of Guatemalan parents and 7.7% of American parents were aware of the weight of their children's schoolbags[12].

Al-hazzan carried out a study on how much school backpack load Saudi boys carried on their shoulders. The study was aimed at investigating the percentage of body weight, determining the dimensions of school bags and identifying the method of carrying these bags to and from school. The result of the study showed that the average weight of school

bags among the study sample was 3.2kg and that a considerable proportion of them carried overloaded and oversized bags. This is because nearly 50% of the pupils carried bags that weighed more than 10% of their body weight; and 29% of them carried these bags while walking to school. The difference between in the backpack use of the Saudi boys and most other countries, as shown in this study, is the popularity of wheeled bags. 14.5% of the boys in this study had such bags[13].

Kiasu Editor wrote in an article about the necessity of ergonomic school bags that school bags had become heavier since the Covid-19 because teachers preferred that children had their books with them always instead of leaving them in the school as a result of the uncertainty of in-class or on-line lessons. Thus, in case there was a change in policy like switch to home-based learning at short notice, the children would not be without their school supplies. Another factor that contributes to heavy school bags, according to this writer, is that schools require the students to have personal learning devices, like laptops and Ipads, in addition to already heavy books. This writer says in choosing school bags the emphasis of bag designers is usually on having an ergonomic design. He is of the view, however, that the emphasis should be on backpack load and duration and distance backpacks are carried. He says any bag will cause strain on the user if it is filled to the brim or heavier than the recommended carrying load and suggests that maximum schoolbag weights be recommended and emphasised the way the Health Promotion Board has done in Singapore. He also said school bags, especially heavy school bags daily, can certainly contribute in neck, back and shoulder pains; contribute to poor posture, aggravate existing spinal condition and even cause nerve damage; and this is worsened by the fact that children travel long distances by walking, on public transport and going from classroom to classroom[14].

Alghamdi et al carried out a study on schoolbags and back pain among intermediate female students in Dammam city of Saudi Arabia. A total of 300 female students had their weights and those of their bags taken; given structured questionnaires and open-ended questions about their method of carrying school bags. In assessing the weight of the school bags, the researchers used 15% maximum body weight and discovered that 288 students representing 96.2% of the sample had bags that weight more. They reported the bags were heavy because the girls carried heavy books, laptops, sports kit and packed lunches. A large number of these students are said to have complained of shoulder and neck pain[15].

Dockrell et al investigated the weight of school bags and the factors related to schoolbag carriage among first year secondary school students in 2 community schools in Dublin, Ireland. The study involved 57 students who had a mean age of 13.1 years. The average schoolbag weight was 6.2kg with 68% of the children carrying more than the recommended 10% of body weight. The result showed that even though 95% of the students had backpack style school bags, only 65% of them carried them over both shoulders. 80% of these children complained of discomfort from carrying their bags[16].

Olatunya and Oyinkansola carried out a study on the use and associated problems among primary school children in Nigeria: A call to action, which evaluated the use of backpacks in Ado-Ekiti, Ekiti State in the Soeth west of Nigeria. A descriptive survey was used to look at the bags of 813 primary 6 children. The result showed that 788, representing 96.9% of the children used backpacks, which they carried daily. Out of this number 85% had the backpacks on both shoulders while the remaining 15% had them around one shoulder or on the arm. In 79.1.% of the cases the backpacks the children carried weighed above 19% of their body weight. The authors concluded there a need to consciously set up a guideline and advice parents about the dangers of such excess load on their children[17].

Akano studied the content of lunch boxes of primary school pupils in Ibadan North East Local government area of Oyo State in the South West of Nigeria. The studied examined the school bags of 298 primary 5 pupils. They found that 80.2% of these children had lunch boxes as part of their luggage. 56.1% of these children carried these lunch boxes

as additional bags/boxes; 29.5% carried lunch baskets while 14.2% had them in party/polythene bags. These lunch boxes all contained different types of food, in addition to water and sweetened drinks[18].

Johnson et al, studied the percent of body weight carried by school children in a Nigerian school. The group of medical personnel randomly selected 381 students in a school to study the percent of body weight represented by their school bags. They discovered that only 65% carried the bags on their backs. Their finding is much different from most other researcher on the issue in Nigeria as they discovered that with an average bag weight of 4.48kg, majority of the bags fell within the recommended 10% bag weight[19].

Lasota investigated the schoolbag weight carried by primary school children. The study investigated how many pupils had bag weights that were in excess of the recommended limit of 10% body weight. 108 7–9-year-olds in Primary 1, 2 and 3 were used for the study. With a bag weight mean of 3.33kg for the Primary 1; 3.61kg for the Primary 2 and 3.37kg for the Primary 3 pupils, they exceeded the recommended weights by 78.3%, 43.3% and 40% respectively[20].

The review on the study on school bags looked at studies from Nigeria and different parts of the world. Some of these other places were Ghana, United States of America, Saudi Arabia, Guatemala and Singapore. In Nigeria the studies were concentrated on the South western part of the country. There was no study on Rivers State which is the third largest state in the country. It is this area that this study is intended to cover. Apart from one study which looked at the content of the school bags to determine what was contained in their lunch boxes and how these lunch boxes were carried, the other studies looked at the weight of the school bags in relation to their associated problems which had to do with body pain and musculoskeletal issues as most of the researchers were medical personnel. There is an assumption to the reader that these excess school bags were all one bag. The purpose of this study is not just to investigate the weight of the school bags to determine if they are within the recommended percentage, but to find out how many bags the children carried, what type of bags they are and how they carried them to school[21].

2. Materials and Methods

The purpose of the study is to take a critical look at the school bags primary school children carry to determine the following:

1. How many school bags do the pupils carry?
2. What is the weight of the school bag of primary school children in comparison to the weight of the children that carry them?
3. What type of school bags do children in primary schools carry?

The purpose of the study was a descriptive survey whose purpose was to investigate the number, type, and weight of school bags carried by primary school children in Rivers State. In looking at the weight of the school bags the intention was to determine whether they were within the internationally recommended weight of not exceeding 10% of the body weight of the bag user. One thousand and one (1001) pupils whose parents permitted to be weighed were picked at various parts of Port Harcourt Metropolis, in Rivers State, Nigeria. This is because the study involved weighing the children and their school bags with personal scales.

3. Results

Research Question 1: How many school bags do the pupils carry?

Table 1. Number and Percentage of School Bags Carried by Primary School Pupils.

S/N	Number of Bags	Number of Pupils	Percentage
1	One	137	13.7%
2	Two	746	74.5%
3	Three	110	11.0%
4	Four	8	0.8%
	TOTAL	1001	100%

Table 1 shows that 137 representing 13.7% of the 1001 pupils had one school bag; 746 representing 74.5% had two school bags; 110 representing 11% had three school bags while 8 pupils representing 0.8% had four school bags.



Figure 2. Chart of Number of School bags carried by the primary school pupils.





Figure 3. Nigerian pupils with various numbers of school bags.

Research Question 2: What is the weight of the school bag of primary school children in comparison to the weight of the children that carry them?

As shown in Table 2 shows the percentage of school bag to body weight distribution of the one thousand and one pupils in the study. 358 out of the 1001 students, representing 35.8%, have bags that are the recommended 10% of their body weight. The remaining 64.2% of the children have bags that are above the recommended 10% of body weight. 598 children, representing 59.7% have bags that are above 10.30-49% of body weight while 45 pupils, representing 4.5% have bags that are more than 50% of their body weight. 2 children have bags so heavy they are 70% and 83% of their body weight. This table is illustrated by the chart below.

Table 2. Percentage of Bag weight to Pupils' Body weight at 10% Bag weight.

S/N	Percentage Of Bag To Body Weight	Excess Bag Weight %	No. Of Pupils	Total No. Of Pupils	Percentage Of Pupils
1	0%	0%	11	358	35.8%
2	1-10%	0%	347		
3	10.1 – 19%	0.1-9%	323	598	59.7%
4	20 – 29%	10-19%	160		
5	30-39%	20-29%	89		
6	40-49%	30-39%	26		
7	50-59%	40-49%	28	45	4.5%
8	60-69%	50-59%	15		
9	70	60%	1		
10	83	73%	1		
	TOTAL		1001	1001	100%

Figure 4 illustrates the comparison of school bag weights carried by students across different age groups. It visually presents the variations in bag weight relative to students' body weight, highlighting cases where students exceed the recommended 10% threshold. The figure underscores the prevalence of excessive school bag loads among primary school children, emphasizing the need for policy intervention.

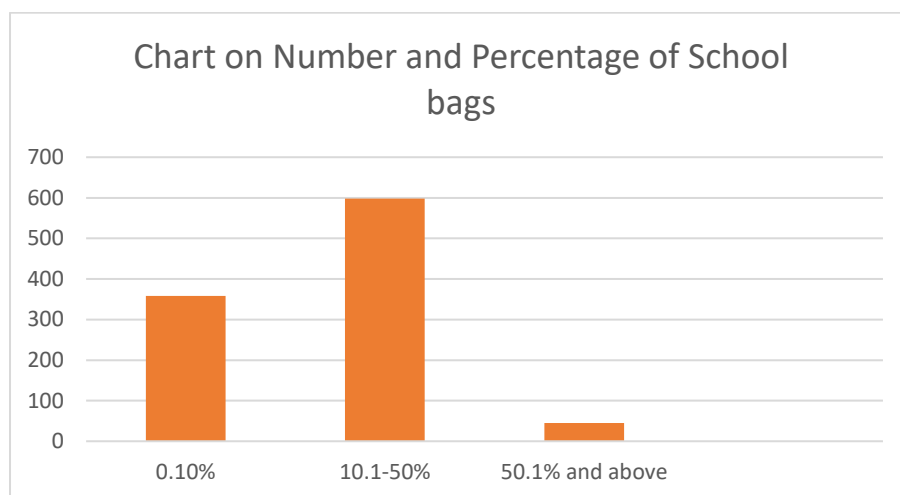


Figure 4. Chart on Number and Percentage of School bags.

Fig.5 shows the school bag/ body weight proportion of the pupils in the study. It shows at a glance that most of the children carried school bags that were above the recommended body weight proportion of 10%. The blue bay represents the 358 children, representing 35.8% whose bags conformed to the specification. The marooned colour bar shows the 643 pupils, representing 64.2% of the children.

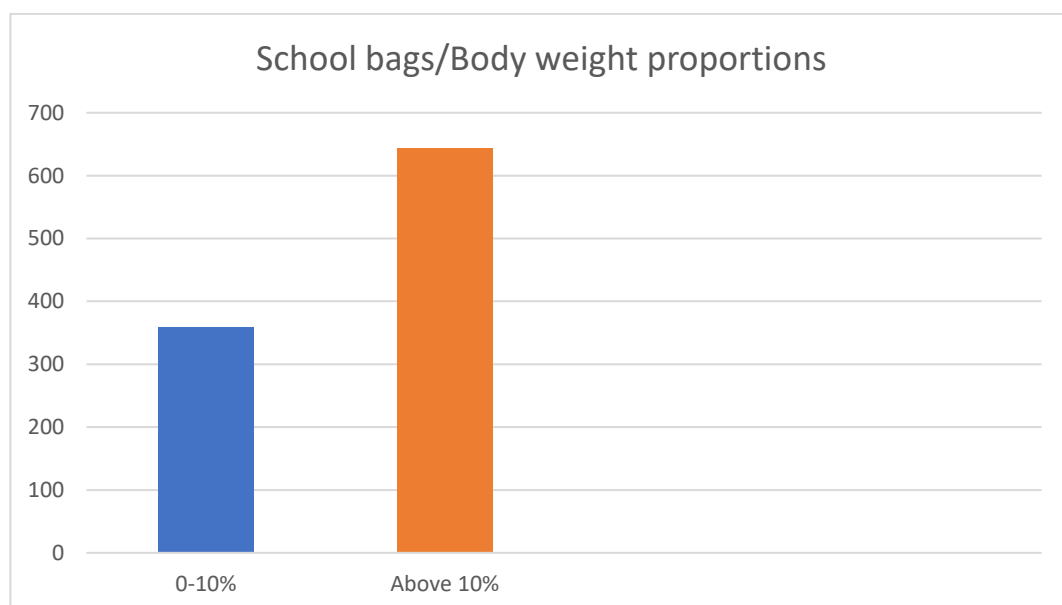


Figure 5. School bags/Body weight proportions.

Table 3. Summary of Bag Weight of Children of Various Class Levels in Primary School.

S/N	Class Level	No of Pupils	Average Body Weight	Average Weight with Bag	Average Difference	10% Body Weight	ABW – 10% Body Weight
1	Primary 1	179	19.7kg	23.04kg	4.2kg	1.9kg	2.3kg
2	Primary 2	300	27.8kg	32.4kg	4.6	2.7kg	1.9kg
3	Primary 3	202	24.8kg	29.4kg	4.6kg	2.4kg	2.2kg
4	Primary 4	137	29.3kg	33.7kg	4.4kg	2.9kg	1.5kg
5	Primary 5	101	30.8kg	36.1kg	5.3	3.0kg	2.3kg

6	Primary 6	82	34.9kg	40.1kg	5.2kg	3.4kg	1.8kg
	TOTAL	1001	167.3kg	194.7kg	27.4kg		

Table 3 presents information on the average weight of bags carried by children of different class levels of primary schools in Rivers State. The average body weight of children in primary 1 was 19.7kg. This means that the average bag weight of the children should be 1.9kg. These 179 pupils had an average weight of 23.4kg with their bags, making the average bag weight 4.2kg. When the prescribed bag weight of 1.9kg is subtracted from the bag weight of 4.2kg, the excess bag weight is 2.3kg. The primary 1 pupils were daily carrying about an average excess weight of 2.3kg. The excess bag weight was 1.9kg for primary 2 pupils; 2.2kg for primary 3 pupils; 2.2kg for primary 3 pupils; 1.5kg for primary 4 pupils; 2.3kg for primary 5 pupils and 1.8kg for primary 6 pupils.



Figure 6. The heaviness of the bag can be felt in how the children carry the bags.

Table 4. Summary of Bag Weight of Children of Various Ages in Primary School.

S/N	Age	No of Pupils	Average Body Weight	Average Weight with Bag	Average Bag Weight (ABW)	10% Body Weight (BW)	ABW - 10% BW (Excess bag Weight)
1	3	1	21kg	23kg	2kg	2.1	-1kg
2	4	15	17.7kg	21.2kg	3.5kg	1.7	1.8kg
3	5	74	20.3kg	23.4kg	3.1kg	2	1.1
4	6	191	20.1kg	23.4kg	3.3kg	2	1.3
5	7	165	23.7kg	28.3kg	4.6kg	2.3	2.3
6	8	186	26.4kg	30.5kg	4.1kg	2.6	1.5
7	9	123	29.3kg	34.2kg	4.9kg	2.9	2
8	10	106	29.4kg	34.4kg	5kg	2.9	2.1
9	11	50	33.5kg	38.9kg	5.4kg	3.3	2.1
10	12	45	30.9kg	37kg	6.1kg	3.0	3.1
11	13	31	41.2kg	47.3kg	6.1kg	4.1	2
12	14	24	46.5kg	52.2kg	5.7kg	3kg	2.7
13	15	11	53.4kg	60.5kg	7.1kg	5.3	1.8
14	16	1	55kg	58kg	3kg	5.5	-2.5

Table 4 presents data on the weight of the school children according to their age. There are children of 14 different ages in this study. They range from 3 years to 16 years belonging to different class groups. The youngest pupil was a 3-year-old who carried a bag that was appropriate to his/her weight. At 21kg this child's recommended bag weight was 2.1kg and the child's bag of 2 kg was well within this limit. The 15 4-year-olds had an average weight of 17.7kg. Their average bag/bag weight of 21.2kg gives them an average bag weight of 3.5kg. This gives them an excess of 1.8kg over their 10% body weight of 1.7kg. 74 5-year-olds carry a bag weight of 3.1kg against their average weight of 20.3 kg, giving them an excess average load of 1.1kg.

Research Question 3: What type of school bags do children in primary schools carry?

Table 5. Distribution of the type of the primary bags of the children.

S/N	Type	Number	Percentage
1	Back Packs	797	79.6%
2	Shoulder Bags	17	1.7%
3	Hand Bags	50	5.0%
4	Sack/Polythene Bags	127	12.7
5	No Bags	10	1.0%
	Total	1001	100%

Table 5 shows the types of the primary bags of the children. As shown earlier, a lot of the children had additional bags which were most certainly carried on the hand. This table shows the type of the main bag of the children. 797 of the 1001 children had backpacks which they wore around both shoulders. This was for majority of the children, representing 79.6%. 17 children representing 1.7% had bags that they wore over one shoulder. 50 children representing 5% carried bags that could be described as handbags because they were worn around the arm like a lady's handbag. 127 children representing 12.7% had sacks and polythene bags (shopping bags) as their school bags. 10 children, representing 1% held their books and school materials in their arms because they did not have school bags.





Figure 7. Different types of school bags carried by primary school pupils in Rivers State.

4. Discussion

The study sought to find answer to three question the use of school bags in primary schools in Rivers State, Nigeria, and made the following discoveries:

1. Majority of primary school children went to school every day with more than one bag. Out of the 1001 children involved in the survey, only 137 representing 13.7% of the children carried one bag to school. The remaining children, representing 86.3% carried two, three or four bags to school. That the children carry more than one bag as not surprising as Akano stated in the result of his study in Oyo State, South west Nigeria that 80.2% of the pupils had a bag for their lunch which was different from the book bags[22].
2. The majority of the children carried school bags that were too heavy for their fragile, still developing young bodies. Only 35.8% met the recommended bag weight of 10% of their body weight. This was 358 of the 1001 pupils. 643 children representing 64.2% of the children had bags that were above the recommended body weight. This high percentage of children who carried bags that are higher than the recommended body weight agrees with findings in other parts of Nigeria and the world[23]. Forjuoh reported results of between 55.3 and 73.6% in his studies carried out in Ghana, Guatemala and the United States of America. The situation was not much different in Dublin, Ireland, Saudi Arabia and South west Nigeria where Dockrell et al, Alghamdi, and Olatunya & Oyinkansola respectively got similar results[24].

The result of the study shows that majority of the children had backpacks as their main school bags. This accounts for 79.6% of the children. The implication of this, however, is that for the 86% of the children who had more than one bag, their load is still resting on their hand instead of being evenly distributed on their backs[25]. The 12.7% result of the children who had polythene bags is similar to that of Akano whose result showed that 14.2% carried party/polythene bags[26].

5. Conclusion

The implication of the finding of this study is that primary school children are carrying weights on their shoulder and hands that are far too heavy for their fragile young bodies to bear. A situation in which some students carry as much as 50, 70 and 80% of their body weights in their school bags is totally not acceptable. Even though the study was not carried out to determine the health implications of the excess bag weight, from the review of available literature, it is easy to deduce the likely, if not occurring health implication of the bags. The result of the study has shown us a lot of things that need to be looked into

and corrected before they become health issues the state and country. This is particularly so because the country has a young population which needs to be protected. The recommendations are as follows:

- a. It is necessary to carry out a larger study to ascertain the real scale of the problem of prevalent heavy school bags
- b. The government should find out the reason for the heavy school bags children carry and try to solve them.
- c. There is a need for proper guideline for school bag weight as is the case in other countries.

There is the need to carry out medical examinations on the children to ascertain health issues that could have developed from the use of these heavy school bags and start the correction process early."

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