MUSCULOSKELETAL PAIN AND SCHOOL BAG USAGE AMONG UPPER PRIMARY SCHOOL- GOING CHILDREN IN NAIROBI CITY COUNTY, KENYA

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Q57/CTY/PT/23182/12

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SEPTEMBER 2016
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or for any other award.

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To my wife Janet and daughters Charlotte, Ivy and Angel for their patience, unwavering support and encouragement in the course of the entire undertaking.
ACKNOWLEDGEMENT

Firstly I thank the Almighty God for His grace that has enabled me get this far. My sincere gratitude goes to my supervisors Dr. Justus Osero and Dr. Lucy Joy Wachira for their guidance, support and very useful contributions during my study.

Special thanks to Dr. John Paul Oyore for his timely guidance and valuable advice.

My appreciation goes to Mr John Arudo for his guidance and insight as I developed the concept for the study.

I wish to thank the National Commission of Science and Technology and the Ethical Review Committee of Kenyatta University for their approval to carry out this study. Special thanks also to the County Director of Education, Starehe sub-county, the head teachers and importantly the class teachers of the 8 primary schools where the study was conducted.

Last but not least, special thanks go to the parents/guardians who consented for their children to be recruited in the study and the pupils for their participation in the study without which this work would not have been possible. To all may God bless you.
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**OPERATIONAL DEFINITION OF TERMS**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Academic related stress:</strong></td>
<td>Heavy work pressure from too many assignments given out in school.</td>
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<td><strong>Backpack:</strong></td>
<td>School bag carried on the back, worn on the body by school going children.</td>
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<tr>
<td><strong>Ergonomic factors:</strong></td>
<td>Method of backpack carriage, duration taken while carrying bag, posture adopted, strap length and content of backpack.</td>
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<td><strong>Low Back Pain:</strong></td>
<td>Discomfort or ache in the lower back region, emanating from the lower rib curvature to the lower part of the seat region.</td>
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<tr>
<td><strong>Musculoskeletal pain:</strong></td>
<td>Discomfort or ache in the body's joints, ligaments, muscles, nerves, tendons, and structures that support the neck, shoulders and back among children in upper primary in Starehe sub-county.</td>
</tr>
<tr>
<td><strong>Method of carriage:</strong></td>
<td>Carrying of school bag on back using one strap or two straps over the shoulders.</td>
</tr>
<tr>
<td><strong>School bag use:</strong></td>
<td>Carrying of school bag by upper primary school going children in Starehe sub-county to and from school that include factors such as; method and duration of carriage, content and weight of the bag.</td>
</tr>
<tr>
<td><strong>Type of backpack:</strong></td>
<td>School bag with either one strap or two straps.</td>
</tr>
<tr>
<td><strong>Upper primary:</strong></td>
<td>Primary school classes 4 to 8 in Starehe sub-county.</td>
</tr>
</tbody>
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# Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAOS</td>
<td>American Academy of Orthopaedic Surgeons</td>
</tr>
<tr>
<td>ACA</td>
<td>American Chiropractic Association</td>
</tr>
<tr>
<td>AOTA</td>
<td>American Occupational Therapy Association</td>
</tr>
<tr>
<td>APTA</td>
<td>American Physical Therapy Association</td>
</tr>
<tr>
<td>ICPA</td>
<td>International Chiropractic Paediatric Association</td>
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<tr>
<td>BTBW</td>
<td>Backpack to body weight</td>
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<td>BTSW%</td>
<td>Percentage of Bag weight to Schoolchild’s Weight</td>
</tr>
<tr>
<td>BW</td>
<td>Body Weight</td>
</tr>
<tr>
<td>CMDQ</td>
<td>Cornell Musculoskeletal Discomfort Questionnaires</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometres</td>
</tr>
<tr>
<td>LBP</td>
<td>Low Back Pain</td>
</tr>
<tr>
<td>n.d</td>
<td>No date</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>Sq</td>
<td>Square</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analogue Scale</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</table>
ABSTRACT

There has been a growing concern on the effect of heavy backpack on health among school going children who are at an important stage of their growth and development. Grade-based learning has pushed many students to carrying heavy backpacks hence leaving them exposed to musculoskeletal problems. The objective of this study was to measure the backpack weight carried by pupils in Starehe sub-county in order to assess the effects of backpack weight on musculoskeletal pain. A descriptive cross sectional design was used. The study population comprised upper primary school going children in Starehe Sub –county, Nairobi County. Systemic random sampling method was used in selection of schools and school going children using backpacks. A sample of 379 school going children was selected from 6 public and 2 private schools in the Sub- County. Structured interviews, observation checklists, and Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) were used to capture data on musculoskeletal pain and backpack use. Pretest of the tools was conducted in one primary school in the Sub –county. Validity and reliability of the instruments was tested through Visual Analogue Scale (VAS) and Kappa statistics for CMDQ. The research assistants were trained on use of the tools and verification was done for completeness of the instruments during data collection. Data analysis was done using SPSS version 21. Statistical significance was set at 0.05. Descriptive and inferential statistics, that is, frequencies, mean, chi square and logistic regression were used in data interpretation. Majority of pupils (73.6%) complained of musculoskeletal pain. Low back pain (25.1%) was the most prevalent musculoskeletal pain followed by neck pain (16.9%). Very few pupils (0.8%) experienced pain in their right wrist. There was a significant association between backpack weight to schoolchild body weight (BTSW%) and the presence of musculoskeletal pain (p<0.05) with the proportion of pupils carrying school bag weighing more than 15% of their body weight being 28%. The results also revealed that most pupils (71.2%) did not take a break from carrying their backpacks. This study concluded that school children who carry backpacks that weigh more than 15% of their body weight (BTSW%) are at risk of experiencing musculoskeletal pain. It is recommended that the backpack weight percentile be reduced to less than 15% body weight of the school going child.
CHAPTER ONE: INTRODUCTION

1.1 Background

Studies conducted globally have noted association of school bag use and musculoskeletal injuries, pain and discomfort (PuckRee et al., 2004; Van Gent, 2003; Young et al., 2006; Zimbler, 2000). Such studies have measured and identified numerous physiological responses, biomechanical stresses, and a high prevalence of musculoskeletal symptoms related to the repetitive stress of carrying a backpack (Chiang et al., 2006).

Cavallo et al., (2002) have pointed on rising cases of children between the ages 5 to 18 with back and shoulder pain related to the use of heavy backpacks seeking medical attention as reported by American Academy of Orthopaedic Surgeons (AAOS) and Consumer Safety Commission (CSC). Similar findings of injuries and emergency room visits related to backpacks and book bags in children 5 to 14 years old have been presented by the US Consumer Product Safety Commission National Electronic Injuries Surveillance System (NEISS) database in America as reported by Chiang et al., (2006). Another study by Grimmer et al. (1999) on Australian students found associations between loads carried and reports of back or spinal symptoms but did not describe what the associations were.

Few studies conducted at the regional level, notably in Nigeria, South Africa and Uganda (Johnson et al., 2011; PuckRee et al., 2004; Mwaka et al., 2014) showed that a significantly large number of children experienced musculoskeletal pain that is linked to schoolbag use. A significant increase in weight and size of the school bags has been thought to contribute to the pain in the school children (Johnson et al., 2011). In the
Uganda study most of the children who complained of musculoskeletal pain attributed it to heavy school bags used (Mwaka et al., 2014).

The study by Johnson et al., (2011) noted recent upsurge in low back pain among children and adolescents in Nigeria necessitating the study on backpacks weights in children and adolescents in the same country. In a similar study in South Africa by Puck Ree et al., (2004), results showed that a significantly large number of children experienced moderate pain although the bags of the majority of the children weighed less than or equal to 10% of their body weight. A significant increase in weight and size of the school bags has been thought to contribute to the pain in the school children (Johnson et al., 2011).

Regionally, there are very few studies that have explored the problem of musculoskeletal pain among school going children, much less the link between backpack use and musculoskeletal pain (Mwaka et al., 2014; Johnson et al., 2011). Within the Eastern Africa region only one study by Mwaka et al., (2014) explored the topic on musculoskeletal pain and backpack weight to some considerable length. Results from the study on Ugandan students revealed that musculoskeletal pain was associated with carrying heavy backpack as noted from complaints among majority of students thus recommended the provision of libraries and lockers to minimize unnecessary loading and recurring strain injury among students (Mwaka et al., 2014)

Despite the concern of this growing health problem globally and regionally, in Kenya there is very limited literature on the problem of musculoskeletal pain and its association with school bag use among school going children. Public concern has been raised through
the media in the recent past in Nairobi County regarding the heavy school bags that the children carry to and from school but not much has been done to investigate the impact of the load to the health of the school-going children.

1.2 Statement of the Problem

Globally, there have been several complaints from different stakeholders in school health about children carrying backpacks that are heavier than the recommended safe load limits of between 10% and 15% percent of the pupil’s body weight. Studies have shown that most students carry loads that are beyond the proposed limit, thus contributing to high prevalence of musculoskeletal pain among children (MohdAzuan et al., 2010; Mwaka et al., 2014).

Many researchers have shown that the prevalence of musculoskeletal pain among school going children ranges from 30% to 50%, even though the overall prevalence of musculoskeletal pain such as low back pain in school going children has been shown to be as high as 65% (Neuschwander et al., 2010).

Childhood musculoskeletal pain can contribute to significant debilitation persisting even into adulthood (Johnson et al., 2011). The demand for better grades has resulted to students carrying loads of books to maximize reading at homes and in schools. In Nairobi County particularly, this is a major concern that has been noted as school children carry heavy school bags; heavier than the ones carried by students while in Form Four; all in the quest of being in the national’s 100 best students or schools. Since such children carry their backpacks on a daily schedule, the problem of musculoskeletal pain among school
going children was presenting possible detrimental effect of backpack use on health. This warranted further research through this investigation.

1.3 Justification of the study

In Kenya, there is very limited literature on the subject of musculoskeletal pain among school going children. This is despite of an increasing apprehension among parents, stakeholders in education, as well as physicians about the frequent grievances raised by students concerning the distress and musculoskeletal pain associated with carriage of heavy school bags.

The results from this study will be beneficial to both parents and teachers in promoting backpack safety among school going children. The findings will also help promote awareness on the problem of musculoskeletal pain among the children to the general public by health care providers. These findings can also inform formulation of relevant national policies in both health and education sectors regarding backpack safety in school going children.

1.4 Research Questions and Hypotheses

1.4.1. Research Questions

1. What is the prevalence of musculoskeletal pain linked to school bag use among upper primary school going children in Starehe Sub-county?

2. What are the ergonomic factors associated with school bag use and musculoskeletal pain in upper primary school going children in Starehe Sub-county?
3. What are the risks of exposure to musculoskeletal and low back pain among school going children in Starehe Sub-county?

1.4.2. Hypotheses

1. There is no significant relationship between method of school bag carriage and musculoskeletal pain among upper primary school going children.
2. There is no significant link between rest breaks and musculoskeletal pain among upper primary school going children.
3. There is no significant association between backpack weight as percentage of body weight and musculoskeletal pain among upper primary school going children.

1.5 Objectives of the Study

1.5.1. Broad Objective

To establish the relationship between school backpack use and musculoskeletal pain in upper primary school going children in Starehe Sub-county, Nairobi County.

1.5.2 Specific Objectives

1. To determine the prevalence of musculoskeletal pain linked to backpack use among upper primary school going children in Starehe Sub-county.
2. To establish the ergonomic factors associated with school bag use and musculoskeletal pain in upper primary school going children in Starehe Sub-county.
3. To determine the risk of exposure to musculoskeletal and low back pain among upper primary school going children in Starehe Sub –county.

1.6 Delimitation and Limitation

The study focused only on pupils in upper primary classes four to eight. Musculoskeletal pain and the associated factors were assessed using the subjective response of the pupils as recorded by both the structured questionnaire and Cornell Musculoskeletal Discomfort Questionnaire (CMDQ). Some of these measurement tools have potential for sample bias. It is important to note that some recall bias could have been present and unaccounted for especially concerning the pupils’ response on the experience of pain in the last few days prior to conducting the survey. The individual school program dictated the time during which the survey could be conducted and therefore it was not easy to collect data as the pupils arrived or exited the school which could have been the ideal time to get a more accurate reflection of the pupils’ school bag variables under study.

The cross-sectional design used in the study, has certain limitations with respect to making causal inference. It is difficult in this design to establish or account for long term changes that might occur over the years with repeated carriage of back pack while adopting various postures. In addition the study was conducted only in Nairobi which is an urban setting hence the results cannot be generalized to the rural regions. With a sample size of 379 participants in Nairobi, the generalizability of this study is however quite limited.
1.7 Assumptions

Given that the pupils were interviewed mostly at break time in the morning and games
time in the afternoon, it was assumed that the content of the bag was same as it would
have been when the pupil came to and left school. The study also assumed that the pupil
correctly reported the occurrence of pain associated with carriage of the school bag.

1.8 Conceptual Framework

The current study was based on the modified version of the Sauter and Swanson’s (1996)
ecological model initially designed for office and the work of visual display unit (VDU).
The model integrates the cognitive, psychosocial, and biomechanical factors in the
understanding of the development and continuation of musculoskeletal pain and the
resultant effects in the workplace. This model therefore takes into account the impacts of
physical strain in carrying backpacks, and biomechanical strains resulting from method of
bag carriage, duration of carriage among others, as well as individual factors such as
body weight, age and gender on musculoskeletal outcomes as shown in the diagram
(Figure 1.1)
Independent variables

Individual factors:
- Body weight
- Age
- Gender

School bag factors:
- Bag weight
- Bag content
- Strap length

Ergonomic factors:
- Carriage method
- Duration of carriage
- Posture on carriage

Intervening variable

Academic-related stress
- Heavy pressure from others to be successful at school
- Heavy work pressure at school

Dependent variable

Musculoskeletal pain:
- Neck, Shoulder, Back

Figure 1.1: Conceptual Framework

Source: Author (Modified from Sauter and Swanson’s (1996) ecological model)
CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of musculoskeletal pain in school children

2.1.1 Global perspective

Global studies have shown that school children across the world suffer from musculoskeletal pain or discomfort (Iyer, 2001; Negrini et al., 2007; Grimmer et al., 2000). Research studies have measured and identified numerous physiological responses, biomechanical stresses, and a high prevalence of musculoskeletal symptoms related to the repetitive stress of carrying a backpack (Grimmer et al., 2000; Negrini et al., 2007; Pascoe et al., 1997; Wang et al., 2001).

Backpacks constitute a significant daily amount of “occupational” load for school children (Negrini et al., 2007). In the US, for example it was noted that the use of backpacks resulted in more than 6,000 injuries in a single year alone with more than 7,000 emergency room visits related to backpacks and book bags (NEISS, 2001). Approximately half of those injuries occurred in children 5 to 14 years old. Studies conducted in Australia, China, India, New Zealand and Middle East have reported similar findings (Wang et al., 2001; Grimmer et al., 2000; Iyer, 2001; Al-Hazza, 2006).

A study conducted in China among school children found out that school bags weighing as low as 10% of the child’s body weight caused the trunk to lean forward with resulting low back problems (Wang et al., 2001). Researchers have demonstrated that prolonged loading of the spine raises the risk of lower back pain in youths, and the most common contributing loads are from backpacks (Negrini et al., 2007). According to Negrini and
colleagues, the number of school children who report discomfort or back pain when carrying backpacks is high.

Grimmer et al., (1999) in their study on Australian students found associations between loads carried and reports of back and spinal symptoms but did not describe what the associations were. Common musculoskeletal problems noted in the study were low back pain and neck pain. In a similar study by Negrini et al., (2007) that examined backpack loads of Italian children, the researchers found that the average load carried was 22.0% of bodyweight exceeding the guidelines set by various organizations.

Backpack use is widespread and an important tool in supporting one’s engagement in a student role; however, as many as 46.1% of middle school children experience pain from carrying a backpack (Negrini et al., 2002). Similar prevalence has been reported in studies conducted in India (Iyer et al., 2001) and the Middle East (Al-Hazza, 2006).

2.1.2 Regional perspective

In the African region, few studies have been conducted on musculoskeletal pain and its association with backpack use. Studies done notably in Nigeria, South Africa and Uganda (Johnson et al., 2011; PuckRee et al., 2004; Mwaka et al., 2014) showed that a significantly large number of children experienced musculoskeletal pain that is linked to schoolbag use. Significant increases in weight and size of the school bags has been attributed to the pain in the school children (Johnson et al., 2011).

In the Uganda study most of the children who complained of musculoskeletal pain attributed it to heavy school bags used (Mwaka et al., 2014). Results from the study on
Ugandan students revealed that musculoskeletal pain was associated with carrying heavy backpacks as noted from complaints among a majority of students, thus recommended the provision of libraries and lockers to minimize unnecessary loading and recurring strain injury among students (Mwaka et al., 2014).

The study by Johnson et al., (2011) noted recent upsurge in low back pain among children and adolescents in Nigeria necessitating the study on backpacks' weights in children and adolescents in the same country.

A study in South Africa by Puck Ree et al., (2004) showed that a significantly large number of children experienced moderate pain although the bags of the majority of the children weighed less than or equal to 10% of their body weight. A significant increase in weight and size of the school bags has been attributed to the pain in the school children (Johnson et al., 2011).

2.1.3 The Kenyan perspective

In Kenya, there is limited literature on studies conducted on the problem of musculoskeletal pain and its possible association with school bag use among the school going children population.

2.2 Musculoskeletal pain

Musculoskeletal pain is discomfort in the body's joints, ligaments, muscles, nerves, tendons, and structures that support limbs, neck, and the back (Lewis et al., 2014). It results from disorders that can affect many different parts of the body including upper and lower back, neck, shoulders and extremities (arms, legs, feet, and hands). These
disorders can be attributed to biomechanical and physical strain. The burden of musculoskeletal pain and disorders can be manifested in lower levels of quality of life, work performance and productivity loss, impaired mobility, sleep disturbance, cardiovascular disorders and work or occupation related absence (WHO, 2003).

In a study conducted by Chiang et al., (2006), the most commonly reported types of musculoskeletal pain associated with backpacks were lower back pain, shoulder pain, upper back pain and neck pain. Participants in that study attributed the pains to heavy backpacks and longer duration of carriage.

2.2.1. Biomechanical strain

Musculoskeletal disorders can arise from a sudden exertion, repetitive strain or over use, or from repeated exposure to force, vibration, or awkward posture (Lewis et al., 2014). Back packs have a lasting physical impact on the backs of the school children. The physical impact affects the development of the skeletal structures on the children’s back. Consequently, these effects may further influence the mechanical activity and flexibility of the child (Sommerich, 2009).

Heavy bags exert mechanical strain on the backs of school children, thus making the backbone to bend with the load (Negrini & Negrini, 2007). Subsequent strain on associated structures such as the muscles and nerves on the back make school children to develop back pains. Posture is especially important in children while the spine is still growing. However, school children tend to lose their posture due to the heavy back packs that they often carry to the schools. Back pain is now chronic among the poor populations where children carry their heavy bags and walk longer distance. (Sommerich, 2009).
The body structures of the school going children are undergoing rapid growth and therefore excessive load carrying may lead to structural damage due to additional stress (Chiang et al., 2006). The spines of younger children are more prone to backpack related injury because they lack control and the supporting muscles are not well developed (Cavallo et al., 2002).

2.3 School bag use

Persistent use of backpack makes the back compensate for the load placed upon it causing a forward lean that result in a loss of balance, poor posture, increased muscle strain and irritation (Cavallo et al., 2002). A separate study by Chiang et al., (2006) reported that carrying a school bag significantly altered the posture and gait of children aged 11 to 13 years, through decreasing stride length, increasing stride frequency and promoting a greater forward lean of the trunk (Chiang et al., 2006).

Studies conducted have concluded that school-bag carriage variables including the schoolbag weight, method of carriage, strap length, time spent carrying school-bag among other factors influence the risk of musculoskeletal symptoms such as pain and discomfort in different body regions of primary school children (Javadivala et al., 2012; Mwaka et al., 2014). Though mentioned among the factors that can influence occurrence of musculoskeletal pains, no ideal strap length has been documented for any age or height. It therefore means that there exists no particular standard strap length or specific norms against which the strap lengths can be measured. This study looked at the extent to which the backpack fitted on the pupil’s back or away from the back. The actual length of the strap was therefore not a primary concern.
2.3.1. Factors influencing school bag weight

Increased homework assignments and changing curricula have necessitated need for school going children to carry more books to and from school. Teachers, parents and children have placed emphasis on academic success and many schools raise standards hence more homework assignments (Cavallo et al., 2002). The contents of school bag may include items such as extra clothing, lunch boxes, stationery and other personal items and most schools lack lockers that the children can use to store such items (Mwaka et al., 2014; Neuschwander et al., 2010).

2.3.2. Backpack weight

The heavier the backpack, the more pressure it exerts on the spinal column and back muscles as the children bend forward in an attempt to support the weight on the back rather than on their shoulders hence development of neck and back pain (Puck Ree et al., 2004).

Studies have shown that many children carry bags weighing more than 10% of their body weight (Mwaka et al., 2014). Backpack weights as high as 20% of the respective body weights of the children have been documented (Iyer et al., 1999).

Wang et al., (2001) in a separate study report that even a school bag weighing 10% of the body weight of the school child caused the trunk to lean forward. It can therefore be inferred that if body inclination causes low back problems, school bags of 10% body weight exceed the recommended carrying weight for the child (Wang et al., 2001). A maximum school bag weight of not more than 10% of the child’s body weight has been
recommended in other studies due to the deviations in spinal posture observed (Lohman et al., 2006).

Various professional associations including American Academy of Orthopaedic Surgeons (AOTA), American Chiropractic Association (ACA), American Occupational Therapy Association (AOTA) and International Chiropractic Paediatric Association (ICPA) have established guideline weight limits for backpacks as a percentage of a child’s body weight which fall in the range of 5% to 20% of body weight (Cavallo et al., 2002). These guidelines have been set to protect children from harming joints and muscles.

Even though disagreement on recommended backpack weight exists, professionals agree that many of the backpacks carried by children are heavy and can cause musculoskeletal injuries hence need to limit the weight (Cavallo et al., 2002; Dianat et al., 2012).

2.3.3. Method of carrying backpacks

Recommendations have been made by professionals that backpacks should be carried on both shoulders (Zimbler, 2000; Cavallo et al., 2002; Mwaka et al., 2014). By placing the backpack straps on both shoulders, the weight of the backpack is distributed evenly and supported by back and abdominal muscles (Zimbler, 2000). In a study by Pascoe et al., (1997) it was found that the use of one strap led to a marked elevation of the supporting shoulder with notable deviation of the spine away from the backpack’s weight. However, when both straps of the backpack were used, there was no change in position different from the unloaded situation. Chiang et al., (2006) posit that even a heavy two-strap bag can affect both posture and gait. Troussier et al., (1994) in their study concluded that
there is a significant correlation between the presence of pain and the position of carrying the backpack.

2.3.4. Duration of carrying backpacks

Research suggests that heavy schoolbags, long durations of carriage and lack of access to lockers might be factors of musculoskeletal symptoms (Mwaka et al., 2014). Students’ backpacks are often loaded with books and supplies for the entire day particularly in schools without lockers (Chiang et al., 2006). Previous studies (Chiang et al., 2006) that have investigated on duration of carriage have found that less time spent carrying backpack is associated with minimal number of children complaining of low back pain. Mwaka et al., (2014) noted that carrying a heavy school bag for long periods of time could result in repetitive stress injuries to the growing body. This follows the shifting of the child’s centre of gravity in the direction of the load when carrying a backpack.

The longer the children carry bags to schools, the more predisposed they become to the musculoskeletal pain and disorders (Neuschwander et al., 2010). It has been found that most school-going children are forced to carry heavy bags every time they go to school and this makes it possible for the development of the musculoskeletal disorders as well as back pains (Neuschwander et al., 2010).

2.4 Summary of Literature Review

The use of backpack has become a common practice by school going children globally. Studies highlighted in the preceding literature have shown that carrying of school bags can cause musculoskeletal disorders such as pain and aches among those who carry the backpacks. Concern has been raised globally and regionally about the rising cases of
musculoskeletal pain associated with backpack use among school children. However the extent of this problem in Kenya was not documented as of the time of this study. Studies that were conducted elsewhere focused on finding associations of musculoskeletal pain with the school bag factors such as; bag weight, bag content, and backpack weight to school child’s weight percentage. This study sought to find out on these documented school bag factors in Kenyan school going children population in which such relevant literature is limited. The study also looked at important factors related to school bag use that have not been documented in previous studies thus; perception of school bag weight by the pupil, who determines the content of the bag and posture adopted when carrying backpack.
CHAPTER THREE: MATERIALS AND METHODS

3.1 Research Design

This was a descriptive cross-sectional study design in which the musculoskeletal pain and potentially associated factors were measured among upper primary school going children in Starehe Sub-county. Even though this design is marred by difficulty to make causal inference, it was chosen for the study since it is relatively inexpensive, takes little time, provides estimate of the prevalence of outcome, and can be used to assess several outcomes and risk factors at the same time, among many other advantages (Levin, 2006)

3.2 Study Variables

3.2.1 Independent variables

Predictor variables included pupil’s body weight, backpack weight, backpack weight as a percentage of school child’s body weight, type of backpack, method of backpack carriage, rest break from carriage of bag and pupil perception of backpack weight and posture while wearing the backpack.

Rest breaks from carriage of school bag was evaluated by finding out from the pupils if they had a period of rest during which the bag was offloaded during their travel to and from school, and the duration of that rest. The percentage of backpack weight to schoolchild’s weight (BT SW %) was calculated using the following equation:

\[ \text{BT SW}\% = \left(\frac{\text{BW}}{\text{SW}}\right) \times 100\% \]
3.2.2 Dependent variables

The outcome variable was musculoskeletal discomfort, aches, or pain. Musculoskeletal pain was assessed by “yes or no” answers to the question: (“During the last one week did you experience ache, pain, discomfort in the neck/shoulder/back, arms/legs/knees?”)

“Do you feel ache, pain, discomfort while carrying the school bag or thereafter?”

3.2.3 Intervening variables

Academic-related stress was measured by the following question: “Are you given too many assignments in school?” Responses to these questions were measured on a three-point Likert scale: “no” (1) to “yes” (2), “yes, often” (3).

3.3 Study Site

Starehe Sub–county is situated in the central part of Nairobi County within the former Pumwani District (Appendix F). It covers an area of 20.0 sq km and has a population of 166,041 as per the 2009 census (Infotrack East Africa, n.d.). There are 28 public and about 35 private primary schools in the Sub–county. The Sub–county is made up of a diverse population in terms of socioeconomic class (lower, middle lower, middle upper). This factor led to the choice of this location thereby enabling sampling of school going children from different social classes hence taking into account all the aspects of the independent variable under study.

3.4 Study Population

The study population was the primary school children in Starehe Sub-County. Data held by the County Education Office in Starehe Sub-county showed that there were about 25,000 upper primary school going children in the Sub county. This study targeted upper
primary school going children from class 4 to 8 in Starehe Sub-county, Nairobi County. The content of the school backpack tends to increase when pupils get to upper primary due to the dictate of the curriculum and hence the choice of the study population.

3.5 Sampling Techniques and Sample Size determination

3.5.1 Sample size determination

A sample of 379 school going children was selected for the study. According to Mugenda & Mugenda (2003) if there is no estimate available of the proportion in the target population assumed to have characteristic of interest, 50% should be used as recommended by Fisher et al., (1983).

The following formula was used to determine sample size:

\[ n = \frac{Z^2pq}{d^2} \]

\[ n = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = 384 \]

Where;

- \( n \) = the desired sample size when the population is greater than 10,000
- \( Z \) = the standard normal deviate at the required confidence level (1.96)
- \( p \) = the proportion in target population (50%) estimated to have characteristic being measured (the proportion of school going children experiencing musculoskeletal pain)
- \( q = 1-p \), \( q \) is the proportion of school going children who do not experience musculoskeletal pain
- \( d \) = the level of statistical significance set (Mugenda & Mugenda, 2003)

\( n = 384 \).
Since there were 5897 pupils in the study area, for a population less than 10,000 Cochran's formula was used

\[
\text{Sample size} = \frac{n}{1+(n/\text{population})} \\
= \frac{384}{1+(384/5897)} \\
= 360.52, \text{ which is approximately 361}
\]

This was the minimum sample. However, 5% was added to cater for non-response. Therefore, the sample size was 379.

### 3.5.2 Sampling technique

The study used systematic random sampling in selecting children who used backpacks. Starehe Sub –county was purposively selected for the study due to the diverse nature of the population in terms of socio-economic status as explained earlier. The sixty three schools in the sub county were stratified as public and private. Using a proportion of 3 to 1 based on the high pupil population in the public schools, a sample of six public and two private schools in the sub county were selected through simple random sampling.

Data was collected from pupils in class four to eight (five strata). Listing forms were administered in each class in the selected schools to identify those who used backpacks. A final single list for each school was then drawn of the pupils who used backpack. The list was arranged from the first to the last pupil starting with the pupils in class four to class eight in each school. Systematic random sampling was used to select the requisite number of pupils in each school. The sampling distribution was based on the probability proportionate to size (PPS). \(K^{th}\) interval was calculated by dividing the total upper primary pupil population from the 8 schools (5897 pupils) by the sample size (379
pupils). With the first respondent being selected randomly, every 15th pupil in the list drawn in each school was selected. Therefore, the total number of pupils selected per class varied in each school. A total of 379 pupils were drawn from all the schools as indicated in Table 3.1.

**Table 3.1: Sample distribution based on probability proportionate to size**

<table>
<thead>
<tr>
<th>School</th>
<th>Category</th>
<th>Total no of pupils (class 4-8)</th>
<th>No of pupils required</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>St Teresa’s</td>
<td>Public</td>
<td>512</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>Ndururuno</td>
<td>Public</td>
<td>1392</td>
<td>89</td>
<td>15</td>
</tr>
<tr>
<td>Daima</td>
<td>Public</td>
<td>1156</td>
<td>75</td>
<td>15</td>
</tr>
<tr>
<td>Salama</td>
<td>Public</td>
<td>892</td>
<td>57</td>
<td>15</td>
</tr>
<tr>
<td>Race Course</td>
<td>Public</td>
<td>611</td>
<td>39</td>
<td>15</td>
</tr>
<tr>
<td>Kiboro</td>
<td>Public</td>
<td>481</td>
<td>31</td>
<td>15</td>
</tr>
<tr>
<td>St James</td>
<td>Private</td>
<td>450</td>
<td>29</td>
<td>15</td>
</tr>
<tr>
<td>Valley Bridge</td>
<td>Private</td>
<td>403</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>5897</strong></td>
<td><strong>379</strong></td>
<td></td>
</tr>
</tbody>
</table>

**3.6 Data Collection Tools**

Data was collected through structured questionnaires and Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) administered by the researcher and 5 research assistants. Observation check lists were also used.
3.6.1 Cornell Musculoskeletal Discomfort Questionnaires (CMDQ)

CMDQ is a questionnaire which contains sets of questions alongside a body map drawing indicating the prevalence of musculoskeletal pains or aches in specific regions of the body (Appendix A). CMDQ is not for diagnostic purpose, it is only used for screening purpose. The tool was developed by Professor Alan Hedge and ergonomics graduate students at Cornell University (Cornell University Ergonomics Web, Hedge et al., 1999). The CMDQ tool used in the study particularly focused on musculoskeletal pain related to backpack use.

3.6.2 Structured questionnaire

An interview based structured questionnaire was used to get relevant information from the school going children from various schools in Starehe Sub-county. The questionnaire (Appendix B) was used to get the socio-demographic factors of the school going children as well as means of travel to school, duration of backpack carriage and pupil’s perception of the weight of school backpack. This questionnaire was also used to find out the influence of parent and or teacher on type and content of load in the backpack. The questions were formulated by the researcher based on the objectives of the study.

3.6.3 Observation check list

An observational checklist tool (Appendix C) was developed by the researcher and used to record information on backpack content, carrying styles, strap length and body posture on carrying the backpack. Regarding strap length, an observation was made on the extent the backpack fitted on the pupil’s back or away from the back. As already mentioned, there exists no particular standard strap length or specific norms against which the strap
lengths can be measured. The actual length of the strap was therefore not a primary concern.

**3.7 Pre-test of the tools**

The data collection tools were pretested in one of the schools not participating in the study in Starehe Sub-county. A total of 35 school going children which is about 10% of intended sample size were purposively selected for the pretest. The research assistants were trained on the use of the tools before the pretest was done. Proper entry and verification of questionnaires for completeness was ensured. The aim of the pretest was to find out clarity of the questions, duration to be taken in administering the tools, test the instruments and assess research assistants’ understanding of administration of the tools. The questionnaires were thereafter restructured and corrections made. A provision was made in the questionnaire for recording weight of school backpack.

**3.7.1 Validity**

Visual Analog Scale (VAS) was completed by all school going children in order to determine the validity of CMDQ (Appendix D). VAS is a measurement instrument for capturing subjective aspects or attitudes, which cannot be quantified directly (Wewers et al., 1990). In the study, the pupils made marks on the line on VAS, which indicated their perception of pain. Therefore, correlation between CMDQ severity scale scores and VAS scores was assessed using Spearman correlation coefficient and agreement between responses given in CMDQ frequency scale and VAS was measured by Kappa coefficient. Kappa coefficients ranged between 0.616 and 0.917 across body parts, which indicated considerable to nearly ideal agreement as noted in an earlier study by Sim and Wright.
(2005) between VAS responses and CMDQ frequency scale responses. Spearman correlation coefficients ranged between 0.453 and 0.836 across body parts \((p < 0.05)\), which indicated a positive correlation between CMDQ severity scale scores and VAS scores.

3.7.2 Reliability

As proposed in studies by Marx et al., (2003) and Sim & Wright (2005), to measure test-retest reliability, respondents completed CMDQ two times in an interval of one week. Internal consistency of each scale was assessed by Cronbach’s alpha statistic. Test-retest reliability of CMDQ was independently measured using Kappa coefficient for frequency scale. Cronbach’s alpha statistic for frequency scale was 0.875, which indicated that internal consistency of the CMDQ was high. Frequency Kappa coefficients ranged between 0.565 and 0.948. In agreement to study by Sim and Wright (2005), these results pointed out that conformity between test-retest responses in all three scales were almost to an ideal level.

3.8 Data collection procedures

Data collection was conducted by the researcher and 5 assistants in all the selected schools. This was after obtaining consent from the parents or guardians and after assent from the participants. Fifteen participants did not return the signed consent forms. An equal number was sampled and replaced them after obtaining consent. A calibrated digital Ashton Meyers type weighing machine was used in the study to measure the weight of the participants and their school backpack in Kilograms. The weighing scale was placed on a flat surface in a classroom and set to zero. Each participant was
instructed to step on the weighing scale on bare feet. The weight was first measured with the participant carrying school backpack then without the school backpack. To ensure reliability of the readings, two measurements were taken in both instances (with backpack and without backpack). A third measurement was done in case of a difference of more than 0.5 kg and an average of the scores obtained. The difference between the score with backpack and without backpack was then recorded as the weight of the school backpack in the questionnaire. The participants were thereafter interviewed in the same classroom in the respective schools using the structured questionnaire with specific questions on the variables under study followed by the CMDQ questionnaire outlining body regions affected by backpack use.

For each of the aforementioned body regions (using the CMDQ body map), the pupils were asked to indicate if they had experienced any pain, ache or discomfort in the last week that could be a result of carrying their backpacks. The question directed to the pupil was whether he/she felt any ache or pain while carrying the school bag or thereafter. This was to ensure that the pain reported was due to the school bag carried. Based on the procedure delineated by Whittfield et al., (2005), the recall period of ‘last-week’ was chosen in order to minimize recall bias.

Using the observation checklist, specific observation on carriage style, strap length and content of the backpack was done and the information entered appropriately. Data collection procedures were conducted on the next day following sampling and issuance of consent forms. All the data was obtained on the same day.
3.9 Logistical and ethical considerations

Approval to conduct the study was obtained from graduate school of Kenyatta University (Appendix G). Ethical clearance was obtained from Kenyatta University Ethics and Review Committee (Appendix H). Permission to conduct research was granted by National Commission of Science, Technology and Innovation (NACOSTI) (Appendix I). A letter authorizing access to respondents in primary schools in Nairobi County was issued by the County Education Officer (Appendix J) and school head teachers granted permission in the respective schools. Consent for children to participate in the study was obtained from the parents or guardians by signing in a detailed consent form and assent from school going children received (Appendix E).

3.10 Data Analysis

Data from the research was analyzed using SPSS version 21. Chi square test was used to determine associations between pupil’s weight, age, backpack weight and occurrence of musculoskeletal pain. Logistic regression model was used to determine association of school backpack weight, carriage method and break from carrying backpack as well as school backpack weight as percentage of body weight with musculoskeletal pain. Cross-tabulations and descriptive statistics such as frequencies and mean were used to describe socio-demographic factors pertaining to school backpack use and musculoskeletal pain. Statistical significance was set at 0.05 to test the hypotheses.
CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of the study participants

This section presents results on the socio-demographic factors in the respondents. The information that was sought included the following: the type of school the respondent was from (private or public), gender, age, grade (class level), pupil’s weight, distance covered from home, time taken to travel to and from school and mode of transport used. The summary of these characteristics is shown in Table 4.1. From the total number of 379 school children interviewed, 247 (65%) were from the public primary schools while 132 (35%) were drawn from private primary schools. There were almost equal representation from both gender, 194 (51.2%) of the respondents were males and 185 (48.8%) females. The average age and weight of the participants was 11.97 years and 39.69 kilograms respectively. The maximum age of participants was 16 years and maximum weight was 65 kg. A majority of the participants (21.4%) were aged 13 years while very few (1.8%) were aged 16 years. Half of the respondents 190 (53%) covered a shorter distance less than 500 meters to school while 122 (32.2%) took between 5 and 10 minutes to get to school.
Table 4.1: Socio-demographic Characteristics of Respondents (N = 379)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of School</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td>247</td>
<td>65</td>
</tr>
<tr>
<td>Private</td>
<td></td>
<td>132</td>
<td>35</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>194</td>
<td>51.2</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>185</td>
<td>48.8</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 – 11 yrs</td>
<td></td>
<td>159</td>
<td>42.0</td>
</tr>
<tr>
<td>12 – 15 yrs</td>
<td></td>
<td>213</td>
<td>56.0</td>
</tr>
<tr>
<td>≥16 yrs</td>
<td></td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 4</td>
<td></td>
<td>82</td>
<td>21.6</td>
</tr>
<tr>
<td>Class 5</td>
<td></td>
<td>76</td>
<td>20.1</td>
</tr>
<tr>
<td>Class 6</td>
<td></td>
<td>71</td>
<td>18.7</td>
</tr>
<tr>
<td>Class 7</td>
<td></td>
<td>77</td>
<td>20.3</td>
</tr>
<tr>
<td>Class 8</td>
<td></td>
<td>73</td>
<td>19.3</td>
</tr>
<tr>
<td>Pupil’s weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-35 kg</td>
<td></td>
<td>176</td>
<td>46.4</td>
</tr>
<tr>
<td>36-45 kg</td>
<td></td>
<td>62</td>
<td>16.4</td>
</tr>
<tr>
<td>46-55 kg</td>
<td></td>
<td>106</td>
<td>28.0</td>
</tr>
<tr>
<td>56-65 kg</td>
<td></td>
<td>35</td>
<td>9.2</td>
</tr>
<tr>
<td>Distance from home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500 m</td>
<td></td>
<td>190</td>
<td>53</td>
</tr>
<tr>
<td>500 m - 1 km</td>
<td></td>
<td>164</td>
<td>45</td>
</tr>
<tr>
<td>&gt;1 km</td>
<td></td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Time taken to travel to/from school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 min</td>
<td></td>
<td>38</td>
<td>11.9</td>
</tr>
<tr>
<td>5-10 min</td>
<td></td>
<td>122</td>
<td>32.2</td>
</tr>
<tr>
<td>11-15 min</td>
<td></td>
<td>86</td>
<td>20.6</td>
</tr>
<tr>
<td>16-30 min</td>
<td></td>
<td>80</td>
<td>25.0</td>
</tr>
<tr>
<td>&gt;30 min</td>
<td></td>
<td>34</td>
<td>10.6</td>
</tr>
<tr>
<td>Mode of transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td></td>
<td>338</td>
<td>89.2</td>
</tr>
<tr>
<td>Motor bike</td>
<td></td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>Bus</td>
<td></td>
<td>31</td>
<td>8.2</td>
</tr>
</tbody>
</table>

4.2 Distribution of study participants by backpack usage

Most pupils carried backpack weights of between 1.5 kg and 7.4 kg with 69.1% complaining that the backpacks were heavy. The proportion of pupils who did not take a break from carrying backpack was high (71.2%). More than half of the pupils (69.6%) chose the content of their backpack while books and stationeries were significantly preferred (50.9%).
Among the 379 participants, 91.8% wore the backpacks on the body over both shoulders while 8.2% carried the backpacks over one shoulder. Other aspects of backpack usage are included in Table 4.2

**Table 4.2: Description on Backpack usage by the study participants (N = 379)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpack weight</td>
<td>1.5-4.4 kg</td>
<td>172</td>
<td>45.4</td>
</tr>
<tr>
<td></td>
<td>4.5-7.4 kg</td>
<td>172</td>
<td>45.4</td>
</tr>
<tr>
<td></td>
<td>7.5-10.4 kg</td>
<td>27</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>10.5-13.4 kg</td>
<td>8</td>
<td>2.1</td>
</tr>
<tr>
<td>Pupil perception of weight</td>
<td>Heavy</td>
<td>262</td>
<td>69.1</td>
</tr>
<tr>
<td></td>
<td>Light</td>
<td>117</td>
<td>30.9</td>
</tr>
<tr>
<td>Rest breaks from carrying backpack</td>
<td>Yes</td>
<td>109</td>
<td>28.8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>270</td>
<td>71.2</td>
</tr>
<tr>
<td>Tiredness from carrying backpack</td>
<td>Yes</td>
<td>213</td>
<td>56.2</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>80</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
<td>86</td>
<td>22.7</td>
</tr>
<tr>
<td>Determinants of backpack content</td>
<td>Teacher</td>
<td>63</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>Parent</td>
<td>52</td>
<td>13.7</td>
</tr>
<tr>
<td></td>
<td>Self</td>
<td>268</td>
<td>69.6</td>
</tr>
<tr>
<td>Content of backpack</td>
<td>Books and stationery</td>
<td>193</td>
<td>50.9</td>
</tr>
<tr>
<td></td>
<td>Books, stationery and clothing</td>
<td>58</td>
<td>15.3</td>
</tr>
<tr>
<td></td>
<td>Books, stationery, lunch box</td>
<td>128</td>
<td>33.7</td>
</tr>
<tr>
<td>Method of backpack carriage</td>
<td>Single strap</td>
<td>30</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>2 straps</td>
<td>349</td>
<td>92.1</td>
</tr>
<tr>
<td></td>
<td>Wears on body</td>
<td>348</td>
<td>91.8</td>
</tr>
<tr>
<td></td>
<td>Over 1 shoulder</td>
<td>31</td>
<td>8.2</td>
</tr>
<tr>
<td>Body posture on carriage</td>
<td>Stoops</td>
<td>248</td>
<td>65.4</td>
</tr>
<tr>
<td></td>
<td>Upright</td>
<td>131</td>
<td>34.6</td>
</tr>
<tr>
<td>Academic related stress</td>
<td>Yes</td>
<td>291</td>
<td>76.8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>63</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
<td>25</td>
<td>6.6</td>
</tr>
</tbody>
</table>
4.3 Prevalence of Musculoskeletal Pain

Out of the 379 school children interviewed in this study, majority, 279 (73.6%) reported that they experienced pain when carrying school bag. Figure 4.1 presents the proportion of the school children who reported the occurrence of pain with usage of the backpack.

<table>
<thead>
<tr>
<th>Prevalence of Musculoskeletal Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pain</td>
</tr>
<tr>
<td>26.4%</td>
</tr>
<tr>
<td>Pain 73.6%</td>
</tr>
</tbody>
</table>

Figure 4.1: Proportion of pupils with pain related to backpack carriage
Most of the participants (25.1%) reported lower back pain while 16.9% had neck pains as presented in Table 4.3.

Table 4.3: Prevalence of musculoskeletal pain by site of occurrence (N=379)

<table>
<thead>
<tr>
<th>Site of pain</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>64</td>
<td>16.9</td>
</tr>
<tr>
<td>Right shoulder</td>
<td>54</td>
<td>14.2</td>
</tr>
<tr>
<td>Left shoulder</td>
<td>55</td>
<td>14.5</td>
</tr>
<tr>
<td>Upper back</td>
<td>76</td>
<td>7.5</td>
</tr>
<tr>
<td>Lower back</td>
<td>95</td>
<td>25.1</td>
</tr>
<tr>
<td>Right Upper arm</td>
<td>31</td>
<td>8.2</td>
</tr>
<tr>
<td>Left Upper arm</td>
<td>37</td>
<td>9.8</td>
</tr>
<tr>
<td>Right wrist</td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td>Left wrist</td>
<td>8</td>
<td>2.1</td>
</tr>
</tbody>
</table>

4.4 Exposure to Musculoskeletal pain

The study verified backpack weight as percentage of body weight as a risk factor for musculoskeletal pain. The results indicated that 28% of the pupils carried backpacks weighing more than 15% of their body weight and only 16.4% carried backpacks weighing less than 10% of their body weight as shown in Table 4.4.

Table 4.4: Exposure to risk of musculoskeletal pain (N = 379)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTSW%</td>
<td>Less than 10%</td>
<td>62</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>Between 10% and 15%</td>
<td>211</td>
<td>55.7</td>
</tr>
<tr>
<td></td>
<td>More than 15%</td>
<td>106</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>379</td>
<td>100</td>
</tr>
</tbody>
</table>
4.5 Associations between socio-demographic factors and musculoskeletal pain

There was no significant association between gender and pain (p>0.05). However, age and pupil’s weight were significantly associated with pain (p<0.05) as shown in Table 4.5. The results also showed that majority of the school going children who experienced pain were in the age category of 11-13 years. Most of the respondents who had musculoskeletal pain were of the lowest weight category between 26-35 kg.

Table 4.5: Socio-demographic factors associated with musculoskeletal pain among study respondents (N = 379)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Presence of Pain</th>
<th>P – Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (N) (%)</td>
<td>No (N) (%)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>140(36.93)</td>
<td>54(14.25)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>139(36.66)</td>
<td>46(12.14)</td>
</tr>
<tr>
<td>Age</td>
<td>8 – 10yrs</td>
<td>58 (15.30)</td>
<td>34 (8.97)</td>
</tr>
<tr>
<td></td>
<td>11 – 13 yrs</td>
<td>155 (40.90)</td>
<td>53 (13.98)</td>
</tr>
<tr>
<td></td>
<td>14 – 16 yrs</td>
<td>66 (17.41)</td>
<td>13(3.43)</td>
</tr>
<tr>
<td>Pupil’s weight</td>
<td>26-35 kg</td>
<td>116(30.61)</td>
<td>60(15.83)</td>
</tr>
<tr>
<td></td>
<td>36-45 kg</td>
<td>50(31.19)</td>
<td>22(5.80)</td>
</tr>
<tr>
<td></td>
<td>46-55 kg</td>
<td>86(22.69)</td>
<td>23(6.07)</td>
</tr>
<tr>
<td></td>
<td>56-65 kg</td>
<td>19(5.01)</td>
<td>3(0.79)</td>
</tr>
</tbody>
</table>
Chi square test also indicated that factors such as backpack weight, rest breaks from carrying backpack, academic stress, method of backpack carriage, body posture on carriage were significantly associated with pain \( (p<0.05) \) as shown in Table 4.6.

**Table 4.6: Factors associated with backpack usage**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Presence of Pain</th>
<th>P – Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (% )</td>
<td>No (% )</td>
</tr>
<tr>
<td>Backpack weight</td>
<td>1.5-4.4 kg</td>
<td>111(29.29)</td>
<td>61(16.09)</td>
</tr>
<tr>
<td></td>
<td>4.5-7.4 kg</td>
<td>138(36.41)</td>
<td>34(8.97)</td>
</tr>
<tr>
<td></td>
<td>&gt;7.5 kg</td>
<td>30(7.91)</td>
<td>5(1.32)</td>
</tr>
<tr>
<td>Rest breaks from</td>
<td>Yes</td>
<td>64(16.89)</td>
<td>45(11.87)</td>
</tr>
<tr>
<td>carrying backpack</td>
<td>No</td>
<td>200(52.77)</td>
<td>70(18.50)</td>
</tr>
<tr>
<td>Academic Stress</td>
<td>Yes</td>
<td>227(59.89)</td>
<td>64(16.89)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>41(10.82)</td>
<td>22(5.80)</td>
</tr>
<tr>
<td></td>
<td>Some times</td>
<td>16(4.22)</td>
<td>9(2.37)</td>
</tr>
<tr>
<td>Method of backpack carriage</td>
<td>Single strap</td>
<td>14(3.69)</td>
<td>16(4.22)</td>
</tr>
<tr>
<td></td>
<td>2 straps</td>
<td>265(69.92)</td>
<td>84(22.16)</td>
</tr>
<tr>
<td>Body posture on carriage</td>
<td>Stoops</td>
<td>217(57.26)</td>
<td>31(8.18)</td>
</tr>
<tr>
<td></td>
<td>Upright</td>
<td>62(16.36)</td>
<td>69(18.21)</td>
</tr>
</tbody>
</table>

Logistic regression was conducted to assess whether the six-predictor variables including age, pupil’s weight, backpack weight, backpack weight as percentage of body weight, rest breaks and carriage method significantly predict whether a pupil felt pain (Table 4.7). When the four variables were considered together, there was a significant association between backpack weight and the presence of musculoskeletal pain \( (p<0.05) \) and an association between rest breaks and method of backpack carriage and musculoskeletal pain \( (p<0.05) \) as shown in Table 4.7. There was also a significant association between backpack weight as percentage of body weight and the presence of musculoskeletal pain.
(p<0.05) (Table 4.7). Therefore the null hypothesis that there is no significant association between backpack weight as percentage of body weight and musculoskeletal pain among upper primary school going children was rejected.

Table 4.7: Regression Analysis- Pain as per backpack usage characteristics in the respondents (N=379)

<table>
<thead>
<tr>
<th>Variable</th>
<th>SE</th>
<th>odds</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpack weight</td>
<td>.157</td>
<td>.456</td>
<td>.336-.620</td>
<td>$\chi^2 = 51.95$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$P = 0.001$</td>
</tr>
<tr>
<td>Rest breaks</td>
<td>.303</td>
<td>1.931</td>
<td>1.065 - 3.500</td>
<td></td>
</tr>
<tr>
<td>Carriage method</td>
<td>.385</td>
<td>5.263</td>
<td>2.475 - 11.192</td>
<td></td>
</tr>
<tr>
<td>BTSW%</td>
<td>.047</td>
<td>1.218</td>
<td>1.107 - 1.339</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Prevalence of Various Musculoskeletal Pains

This study sought to find out the prevalence of various musculoskeletal pains among pupils in Starehe Sub County. The prevalence of 73.6% in this study can be compared to overall prevalence of 65% (Neuschwander et al., 2010) and 51.2% as reported by Chiang et al., (2006). Similar studies have reported much lower prevalence of 46.1% (Negrini et al., 2002). The study reconfirmed the high prevalence of lower back pain and neck pain as indicated in other studies (Chiang et al., 2006; Mwaka et al., 2014).

Although not finding linear relationship, some studies reported that pupils who carried heavier backpacks were more likely to have back pain (Grimmer & Williams, 2000; Sheir-Neiss et al., 2003; Viry et al., 1999). Contrarily, other studies did not report any relationship between backpack weight and back pain (Van Gent et al., 2003; Watson et al., 2003). According to the study by Jones and Macfarlane (2005), it was reported that there was no strong relationship between heavy backpack weight and increased future risk of lower back pain.

5.1.2 Associations between ergonomic factors in bag usage and musculoskeletal pain

In general, there was an association between backpack weight and the presence of musculoskeletal pain, particularly lower back pain (p<0.05). This result confirms the findings of the study by Johnson et al., (2011) which noted an upsurge in lower back pain among children and adolescents carrying heavy backpacks. Other studies, which found significant association between backpack weight and presence of pain, included those by
Javadivala et al., (2012) and Neuschwander et al., (2010) which showed increase in lower back pain. Heavy backpack therefore adversely affects pupils’ health, especially leading to increased lower back pain.

The study also found an association between musculoskeletal pain and backpack weight as percentage of body weight (p<0.05). This result is similar to the study by Mwaka et al., (2014), which indicated that prolonged backpack use is associated with neck pain among children who carry backpacks weighing more than 8.5% of their body weight. Thus, the null hypothesis, which indicated no significant association between backpack weight as percentage of BW and musculoskeletal pain, was rejected. This implies that backpack weight has to be limited to a load of between 10% and 15% of body weight.

The study investigated the effect of rest breaks and method of backpack carriage on the presence of musculoskeletal pain among pupils who use backpacks. The results indicated a significant association between method of backpack carriage and pain (p<0.05). Association between rest break taken and pain was also significant (p<0.05). Thus, the null hypotheses that there was no significant link between rest breaks and musculoskeletal pain and no significant relationship between method of backpack carriage and musculoskeletal pain were rejected. There appears to be evidence that time spent carrying a backpack is associated with back pain (Grimmer & Williams, 2000; Negrini & Carabalona, 2002) hence rest breaks is recommended.

Musculoskeletal discomfort among pupils may also be influenced by carrying heavy backpacks to and from school as reported in this study. Other studies have also confirmed increased fatigue with weighty backpacks (Chiang et al., 2006; Dianat et al., 2012;
Even though this study did not investigate the impact of short-term musculoskeletal pain and development of musculoskeletal disorders in the future, there is evidence that back pain at a young age can be predictive of back pain later in life, through adolescence and adulthood (El-Metwally et al., 2004; Reneman et al., 2006). In addition, this study did not find any association between gender and musculoskeletal pain (p >0.05). This is inconsistent with the study by Bettany-Saltikov et al., (2008) and Cottalorda et al., (2003) which indicated that girls are more prone to musculoskeletal pains due to their weaker and more sensitive muscle tissues.

5.1.3 Backpack use

Many pupils (92.1%) carried backpacks over both shoulders. This was consistent with most studies that reported increased pain among students carrying backpacks weighing more than 15% of their body weight over one shoulder (Negrini & Negrini, 2007; Trevelyan & Legg, 2010; Zimbler, 2000). Among the 379 participants, 30 pupils wore their backpacks with one strap while the other 349 pupils carried the backpacks with two straps. From available literature, there is neither an ideal strap length recommended for backpacks at particular age nor specific norms or standards against which the strap lengths can be measured. Experts recommend several ergonomic features to protect back from backpack use. These include wide, padded, adjustable shoulder straps for comfort and greater distribution of weight across the shoulders. Backpacks should also have multiple compartments for distribution of load and increase comfort (Jansport backpacks, n.d.). These features are, nevertheless, more expensive and less frequently used by school going children. Many backpacks commonly used by children feature adjustable straps to
allow varied placement of the backpack on the user’s back. School children should be encouraged to use two shoulder straps and be taught the proper use and importance of the several features on their backpacks, especially for those who have to walk in excess of 20 minutes daily to and from school.

Many pupils (71.2%) did not take a break from carrying their backpacks. Carrying heavy backpacks for long periods could lead to repetitive stress injuries to the growing body. This explains the stooping posture while carrying heavy backpacks since children tend to shift their centre of gravity in the direction of the load when carrying a backpack (Pascoe et al., 1997; Grimmer & Williams, 2000). Those who took a break (28.8%) mostly took about 5 minute’s break (47.8%). This is of great concern considering that with heavy backpacks and limited rest breaks, a pupil is increasingly predisposed to musculoskeletal pain. Those who reported that their backpacks were heavy (57%) also indicated increased fatigue associated with carrying such backpacks. These statistics are comparable to the findings of a research by Haselgrove et al., (2008), which reported a perception of fatigue and backpack heaviness of 50%.

5.1.4 Content of school backpack

Most pupils (69.6%) chose backpack content on their own. The pupils who were influenced by teachers and parents to carry heavy backpack cited pressure to achieve high grades. Those who chose backpack content on their own cited the need to complete homework as the main motivation. Among the respondents, 76.8% claimed that the stress of achieving higher grades led them to choose heavy backpack content. Thus, there was a significant association between academic stress and musculoskeletal pain (p< 0.05). Even
though academic interests influenced the contents of the backpack, pupils also had lunch packs and or water bottles as additional contributors to the backpack weight. To prevent musculoskeletal pain and injuries associated with backpack use, many experts recommend limiting the backpack load to 10% to 15% of body weight (Negrini, 2002).

5.1.5 Backpack weight as percentage of pupil’s body weight

This study found out that 28% of pupils had backpacks weighing in excess of 15% of their body weight. This was consistent with other studies, which reported rates between 15% and 50% (Al-Hazzaa, 2006; Forjuoh et al., 2003; Negrini, 2002). Studies have explored whether there is a critical backpack weight-to-body ratio that if surpassed have an effect on health. Backpack load weighing more than 15% of body weight have been proven to affect health by increasing trunk forward lean (Hong & Brueggemann, 2000; Pascoe et al., 1997), increasing energy consumption and resulting in decreased lung volumes (Hong et al., 2000).

5.2 Conclusion

The following conclusions are drawn from the findings of this study:

1. The prevalence of musculoskeletal pain related to backpack usage in school going children in Starehe sub-county, Nairobi County is 73.6%. The study established that the most prevalent type of musculoskeletal pain experienced is lower back pain and neck pain.

2. Musculoskeletal pain was significantly associated with school bag weight, rest breaks from carrying bag, method of bag carriage and body posture on carriage. It is worth noting that musculoskeletal pain is experienced by school children
carrying school bags for longer duration without rest breaks and who stoop while carrying the bags.

3. School children who carry backpacks that weigh more than 15% of their body weight (BTSW %) are at risk of experiencing musculoskeletal pain.

5.3 Recommendations

5.3.1 Recommendations of the study

From the findings of the study, several recommendations can be drawn for policymakers, parents or guardians and teachers on prevention of musculoskeletal pain associated with backpack use.

i. The government through the Ministry of Education should ensure that teachers are informed on the association between backpack weights and other ergonomic factors on musculoskeletal pain in order to help reduce content of school bag in terms of learning materials that they instruct the pupils to carry to and from home on a daily basis.

ii. The parents and guardians should ensure children have backpacks that are proportionate to their body size and age. Whereas backpacks with adjustable straps are recommended, children need to be provided with information on musculoskeletal pain associated with backpack use.

iii. The school management including the teachers should encourage pupils to carry lighter backpack (less than 15% of pupil’s body weight) and wearing bag on both shoulders.
5.3.2 Recommendations for Further Research

i. A prospective study should be conducted to bring out a clear understanding of the relationship between back pack weight and musculoskeletal pain especially with regard to the pupil’s body mass index.

ii. Future studies should focus on differences in pain among pupils in the urban and rural settings.

iii. Since this study only concentrated on the effects of backpack on children in upper primary, other studies should investigate the link between backpack use among other ages, specifically those in lower primary and adolescents in high school.
REFERENCES


http://www.standardmedia.co.ke/?articleID=2000054818&story_title=giving-hope-to-kibera-children&pageNo=1


APPENDICES

Appendix A: Cornell Musculoskeletal Discomfort Questionnaires (CMDQ)

The diagram below shows the approximate position of the body parts referred to in the questionnaire. Please answer by marking the appropriate box.

<table>
<thead>
<tr>
<th>Body Part</th>
<th>During the last week</th>
<th>If you experienced ache, pain, discomfort in:</th>
<th>If you experienced ache, pain, discomfort, did this interfere with your ability to work?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>1-2 times last week</td>
<td>3-4 times last week</td>
</tr>
<tr>
<td>Neck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Back</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Arm</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Back</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip/Buttocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Leg</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td>(Right)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B: Musculoskeletal Pain and School bag use Questionnaire

Code:  

Section I: Personal information  
1. Age in years:  
2. Gender:  □ Male  □ Female  
3. Educational level:  □ Class 4  □ Class 5  □ Class 6  □ Class 7  □ Class 8  

Section II: Pupil and school bag  
1. Weight of pupil in Kg:  
2. Weight of schoolbag in Kg:  
3. How do you go to school?  □ Walking  □ Motorbike  □ Car  □ Bus  
4. How long does it take to travel from home to school while carrying your bag?  
□ <5 min  □ 5-10 min  □ 11-15 min  □ 16-30 min  □ < 30 min  
5. Do you feel pain while carrying the school bag or thereafter?  □ Yes  □ No  
6. Do you think your school bag is heavy?  □ Yes  □ No  
7. Do you take a break from carrying the school bag?  □ Yes  □ No  
8. If yes, how much time does this break take?  
□ 1 min  □ 2 min  □ 5 minutes  □ > 5 min  
9. Does carrying your bag make you tired?  □ Yes  □ No  
10. Who in your opinion determines the content of your bag?  
□ Teacher  □ Parent  □ Self
## Appendix C: Observational Checklists

<table>
<thead>
<tr>
<th>Backpack Content</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books and stationeries only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books, stationeries, clothing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books, stationeries, lunch/ snack boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Backpack Carrying Styles</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carries backpack with one strap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carries backpack with two straps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing backpack on body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrying backpack over one shoulder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strap Length/ Body posture</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long backpack strap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short backpack strap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stoops when carrying backpack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walks upright when carrying backpack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Visual Analogue Scale.

Code: _______________  Date: _______________

0 1 2 3 4 5 6 7 9 10

No Pain  Moderate Pain  Worst Pain

From: Acute Pain Management: Operative or Medical Procedures and Trauma, Clinical Practice Guideline (1992)
Appendix E: Informed Consent Form

Introduction

My name is Simon Ogana and my research colleagues are ___________________ and ______________. I am a post graduate student at KU, school of Public Health, working with my faculty advisors, DrOsero/ Dr Lucy Joy in the Department of Community Health. I am planning to conduct a research study which I invite your child to take part in.

The purpose of this study is to determine the prevalence and association of school bag use and musculoskeletal pain in school going children. This will help promote awareness on the problem of musculoskeletal pain among school going children and the general public and develop policies on school bag safety. About 320 school-going children in upper primary will take part in this study.

Procedures

Participation in this study will require that I ask the child some questions and record the information in a form, without any personal identification. I will also measure the child’s weight with and without the school bag using a weighing machine. The name will not be written down on the form or anywhere else. The information obtained will be anonymous and completely confidential and will not be shared with anyone other than members of our survey team. Please remember that participation in the study is voluntary.

Benefits and risks

There is no direct benefit to you anticipated from participating in this study. However, it is hoped that the information gained from the study will help stakeholders in education and health to develop, if appropriate, relevant policies on school bag safety. The study does not carry any risk.

For any inquiry contact: The Chairman, Kenyatta University ERC, P. O Box 43844, Nairobi.

Parent/ guardian statement

The above information regarding participation in this study of this child under my care is clear to me. Participation in this study is entirely voluntary. I understand that the records will be kept private and that one can leave the study at any time.

Name of parent/ guardian..............................................................................................................................................................

Signature or thumbprint.......................... Date..............................

Child assent

The nature of the study has been explained to me. I understand that participation is voluntary and the information obtained shall be confidential.

Signature.......................... Date..............................
Appendix F: Map of Nairobi City County
Appendix G: Graduate School Letter

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E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

Our Ref: Q57/CTY/PT/23182/2012

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 4550

DATE: 22nd December, 2014

The Principal Secretary,
Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR SIMON OCHIENG OGANA – REG. NO. Q57/CTY/PT/23182/2012

I write to introduce Mr. Simon Ochieng Ogana who is a Postgraduate Student of this University. He is registered for M.PH degree programme in the Department of Community Health.

Mr. Ogana intends to conduct research for a M.PH proposal entitled, “Musculoskeletal Pain and School Bag Usage among Upper Primary School-Going Children in Nairobi County, Kenya.”

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

AM/CMR
Appendix H: Ethical Clearance from Kenyatta University

Kenyatta University
Ethics Review Committee

Email: chairman.kuerc@kju.ac.ke
secretary.kuerc@kju.ac.ke
ercmu2008@gmail.com
Website: www.ku.ac.ke

Our Ref: KU/R/COMM/51/409

F. O. Box 43844 - 00100 Nairobi
Tel: 8710901/12
Fax: 8711575

Date: 25th February, 2015

Simon Ochieng Ogana
Kenyatta University
P.O Box 43844-00100, Nairobi

Dear Ogana,

APPLICATION NUMBER PKU/299/1278 - “MUSCULAR/SKELERAL PAIN AND SCHOOL BAG USAGE AMONG UPPER PRIMARY SCHOOL GOING CHILDREN IN NAIROBI COUNTY, KENYA”

1. IDENTIFICATION OF PROTOCOL
The application before the committee is with a research topic, “Musculoskeletal Pain and School Bag Usage Among Upper Primary School Going Children in Nairobi County, Kenya.” Received on 7th January 2015, discussed on 20th February, 2015.

2. APPLICANT
Simon Ochieng Ogana

3. SITE
Nairobi County, Kenya.

4. DECISION
The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines AND APPROVED that the research may proceed for a period of ONE year from 25th February, 2015.

5. ADVICE/CONDITIONS
i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

PROF. NICHOLAS K. GIKONYO
CHAIRMAN ETHICS REVIEW COMMITTEE

I…………………………………………accept the advice given and will fulfill the conditions therein.

Signature:……………………………………………… Dated this day of…………………………2015.

cc. Vice-Chancellor
Appendix I: Clearance from National Commission of Science, Technology and Innovation (NACOSTI)

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

Ref: No.

NACOSTI/P/15/6397/4644

Simon Ochieng' Ogana
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Musculoskeletal pain and school bag usage among upper primary school going children in Nairobi County, Kenya” I am pleased to inform you that you have been authorized to undertake research in Nairobi County for a period ending 30th July, 2015.

You are advised to report to the County Commissioner and the County Director of Education, Nairobi County before embarking on the research project.

On completion of the research, you are required to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. S. K. LANGAT, OGW
FOR: DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

Date: 27th February, 2015
Appendix J: Letter from County Director of Education

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

Telegram: “SCHOOLING”, Nairobi
When replying please quote

District Education Officer
Starehe District
P.O. Box 39124-00100
NAIROBI
0722864158

Ref. No. STA/ RE/ 15/02/01
Date: 2nd February, 2015

THE HEADTEACHER
STAREHE SUB-COUNTY PRIMARY SCHOOLS
NAIROBI COUNTY

RE: RESEARCH AUTHORIZATION- SIMON OCHIENG’ OGANNA

This is to inform you that the above has been granted permission to carry out research on “Musculoskeletal pain and school bag usage among upper primary going children in Starehe Sub-county” for a period ending 30th July, 2015.

Please accord him the necessary support.

JOSHUA MWANGI
DISTRICT EDUCATION OFFICER
STAREHE SUB-COUNTY