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CUPRINS / CONTENT

COMPARATIVE EFFECT OF BACK PACK AND MESSENGER BAG ON THE CRANIOVERTEBRAL ANGLE OF SECONDARY SCHOOL STUDENTS

COMPARAREA EFECTULUI PURTĂRII GHOZDANULUI ȘI GENȚII POȘTAȘ ASUPRA MODIFICĂRII UNGHIULUI CRANIOVERTEBRAL, LA ELEVII DIN CICLUL SECUNDAR ȘCOLAR

Akodu AK[1], Akinbo SRA[2], Olusetire OG[3]

Keywords: craniovertebral angle, backpack, messenger bag, secondary school student

Abstract

Introduction: There is a growing concern that overloaded children's backpack and messenger bag may lead to the development of musculoskeletal injuries. Forward head posture and protracted shoulder are two most common deformities causing postural deviations resulting from frequent carrying of heavy backpacks and messenger bags by children and adolescents.

Aim. This study is therefore aimed to compare the effect of backpack and messenger bag on the Craniovertebral angle (CVA) of secondary school students in selected local government's areas in Lagos State, Nigeria.

Methods: Two hundred (110(55%) females and 90(45%) males) secondary students participated in this study. They were within the age range of 10-18 years. Participants were randomly assigned into 2 groups: (group1-Back pack and group2-messenger bag) using computer generated number sequence. The CVA was obtained and was recorded photographically under several load-carrying conditions.

Result: There was statistically significant difference (p=0.000) in the CVA when the backpack or the messenger bag was careried with 15% of their body weight for both type of bags. There was also statistically significant difference (p=0.000) in CVA when the backpack or the messenger bag was carried and the participants were placed on a form of brisk walking for 5minutes with the backpack/ messenger bag and the additional 15% weight.

Conclusions: This study concluded that both the backpack and the messenger bag caused a significant change in the CVA of the participants when carried. Carrying schoolbags weighing ≥ 15% of body weight appeared to be too heavy to maintain normal standing posture for school students.

Cuvinte cheie: unghi craniovertebral, rucsac, gentă de umăr, elevi de gimnaziu

Rezumat

Introducere: Există o îngrjorare generală privid influența greutății prea mari a ghiozdanului sau a genții poștaș asupra apariției lezinunilor musculoscheletale. Capul proiectat înaite și umerii în protracție sunt două dintre cele mai frecvente tulburări posturale apărute ca urmare a căratului unui ghiozdan prea greu, de către copii și adolescenți.

Scop. Studiul de față compară efectele cărării ghiozdanului și a genții postaș asupra unghiului craniovertebral (CVA), la școlarii din ciclul secundar, din zonele guvernamentale ale statului Lagos, Nigeria.

Metode: Două sute de participanți, 110 (55%) fete și 90 (45%) băieți, elevi din al doilea ciclu școlar, au participat la acest studiu. Vărstele sunt între 10-18 ani. Participanții au fost distribuiți aleatoriu în 2 grupuri: (grup 1- ghiozdan și grup 2- geantă poștaș), folosind distibuția numerică computerizată. CVA s-a măsurat și înregistrat fotografic, în diverse condiții de încărcare.

Rezultate: Există diferențe semnificative statistic (p=0.000) între CVA la purtarea ghiozdanului având 15% din greutatea corporală și CVA la purtarea genții poștaș în aceleași condiții. Există de asemenea o diferență semnificativă statistic (p=0.000) a CVA când ghiozdanul sau geanta poștaș au fost purtate în mers timp de 5 minute, încărcat cu 15% din greutatea corpului.

Concluzii: Acest studiu stabilește că purtarea atât a ghiozdanului, cât și a genții poștaș, determină o modificare semnificativă a CVA la participanții luați în studiu. Ghiozdanului care cântărește ≥ 15% din greutatea corporală, pare să fie prea greu pentru a permite menținerea unei posturi corecte în ortostatism, de către elevii din al doilea ciclu școlar.

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INTRODUCTION

Backpacks are commonly used by students of all ages with more than 90% of school children carrying backpacks worldwide [1] and roughly 40 million students in the United States using them on a regular basis [2]. The term "backpack" is a broad term in its definition. Backpacks come in various sizes, shapes and brands. They also come with various types of straps. Single straps bag are typically known as messenger bags or brief cases [3].

However, there is a growing public concern that overloaded children's and adolescent's backpack may lead to the development of back pain and other musculoskeletal injuries [4].Children are introduced to the concept of carrying a backpack as early as 2 years due to decreased availability of school lockers, increased homework, larger textbooks and other objects being carried to school [5]. These have prompted the increase use of bags by school children which has led to both an increase in weight and duration of backpack carriage [5]. This is very applicable to children in secondary schools in Nigeria [6].

Mohan *et al.* [7] reported that external forces such as load carrying in the form of heavy bags may influence the normal growth, development of children and adolescents and also maintenance of alignment of their bodies. Probably, for this reason school children experience a period of accelerated growth and development of skeletal and soft tissues problems. Therefore, load carrying along with irregular spinal growth pattern can affect the adolescent posture and make the adolescent more susceptible to injury [7]. Carrying of heavy messenger bags has shown its adverse effect on the trunk angle of students on the side of carriage [3]. Overtime the continuous carriage of these heavy messenger bags could cause overuse injuries to the hip which will lead to pain and discomfort while walking [3].

Forward Head Posture (FHP) is one of the most common cervical abnormalities that predispose individuals to pathological conditions such as headaches, neck pain, vertebral bodies' disorders, soft-tissue length and strength alteration [8].

Craniovertebral angle (CVA) is one of the common objective methods in assessing head posture [9, 10]. Wilmarth *et al.* [11] and Yip *et al.* [9] defined it as the angle formed by a horizontal line drawn through the spinous process of the seventh cervical (C7) vertebrae and a line joining the spinous process of C7 vertebrae with tragus of the ear. A smaller CVA indicates a greater forward head posture [8].

The average normal value of the CVA in a pain free population is about 50°. Any value below 50° leads to a form of cervical disorders [12, 13, 10]. Past research shows numerous attempts to study the effect of backpack weight on children and the appropriate weight to be carried [14]. A limit of 10-15% of body weight has been suggested as a reasonable limit for adolescents so that backpacks should not exceed 10-20% of a child's body weight [15,16]. Olubusola *et al.* [14], reported that children in Nigeria carry an average of about 10-15% of their body weight as their backpacks. Epidemiological studies, van Niekerk *et al*, [17]; Silva *et al*, [18] have shown a high prevalence of postural deviations in children and adolescents with forward head posture (FHP) and protracted shoulder (PS) posture being two of the most common postural deviations. This is due to the frequent carrying of heavy backpacks by children and adolescents.

These studies were only concentrated on a particular type of backpack which is the popular 2-strapped backpack. Other types of bags like the messenger bags which are also used by some students also in schools have not been put into consideration.

Purpose

This study is therefore designed to compare the effect of backpack and messenger bag on the Craniovertebral angle of secondary school students in Lagos State.

Materials and Methods

Subject

A total number of 200 participants both, male and female students participated in this study. They were recruited from selected secondary schools in four selected Local Government Council Areas of Lagos State. Prior to the commencement of the study, approval was sought from the Health Research and Ethics Committee of Lagos University Teaching Hospital, Idi-araba, Lagos with approval no: ADM/DCST/HREC/APP/765, and from District offices of the Lagos State Ministry of Education. The purpose, relevance and significance of the study were explained to the participants and their school authorities. Purposive sampling technique was used to select the local governments' areas. A simple random sampling technique (Fish and Bowl method) was employed to allocate the participants into either group1 or 2. Group 1 carried the backpacks while Group 2 carried the messenger bags. An informed written consent was obtained from the school's authority and the students before their participation in the study. Any student with obvious musculoskeletal disorders of the neck, scoliosis, recent orthopaedic trauma and deformities, cardio respiratory and neurological problems were excluded from the study.

Assessment

Participants were instructed to maintain a comfortable anatomical standing position. Adhesive markers were placed on the 7th cervical vertebrae (C7) and the tragus of the ear for the measurement of the Craniovertebral angle. Participants from each group were told to stand in the anatomical position with the head erect. The plumb line was set 2 metres away from the participant while a tripod stand and camera were set just behind it. The lateral landmarks marked clearly by the adhesive markers were well exposed. The plumb line was expected to fall in front or through the tragus of the ear and in front of the acromion process. Participant's photographs were taken with the digital camera.

The research procedure was divided into 3 phases: **Phase A**: Without backpack/ Messenger bag. The Craniovertebral angle of the participants were measured without any of the two types of bags. **Phase B**: with backpack/ messenger bag + 15% bodyweight.

Group1: participants were instructed to carry the backpack over their shoulders with an additional 15% of their body weight using the sandbags as weights.

Group 2: participants were told to carry the messenger bag over one shoulder with an additional 15% of their body weight using sandbags as weights. Participants who carried the messenger bags carried the bags over their right shoulder which was their dominant side. The Craniovertebral angle of the participants was measured. **Phase C**: with backpack/ messenger bag + 15% body's weight + 5minutes walk. The participants from each group were placed on a form of brisk walking for 5minutes with the backpack/ messenger bag and the additional 15% weight [19]. After the walk, the Craniovertebral angle of the participants was measured.

The participant's pictures taken were imported into Corel draw X7 software version using the Toshiba laptop to measure the Craniovertebral angle. To measure the Craniovertebral angle, a horizontal line starting from the spinous process of the 7th cervical vertebrae was drawn using the angular dimension of the Corel draw X7 software. Also a diagonal line was drawn through the tragus of the ear to the spinous process of the 7th cervical vertebrae. The angle at the point where these two lines met (spinous process of the 7th cervical vertebrae) was measured and recorded [20, 21, 22, 23, 19, and 10].

Data Analysis/Means

Data was analysed using Statistical Package for Social Science SPSS version 22. Descriptive statistics of mean, standard deviations (SD) and normal distribution of age, weight, height and the Craniovertebral angle were used to summarize the results. Inferential statistics of paired t-test was used to compare the difference between the two types of backpack on the Craniovertebral angle. The level of significance was set at $p < 0.05$.

Result

A total of 200 secondary school students participated in this study. One hundred and ten (55%) of the participants were females while ninety (45%) were males with age ranging from 10 to 18 years. The mean value of the age, height, weight and body mass index (BMI), were 14.13±1.908 years, 1.57±0.91m, 46.50±9.83kg and 18.63±2.81kg/m² respectively.

Table 1: Demographic characteristics of the participants

Variables	Backpack (n=100) X±SD	Messenger Bag (n=100) X±SD	t-value	p-value
Age (years)	14.23±1.752	14.03±2.057	0.740	0.460
Height (m)	1.58±0.09	1.57±0.10	0.794	0.428
Weight (kg)	46.94±9.19	46.05±10.46	0.639	0.523
BMI (kg/m²)	18.67±2.63	18.59±2.99	0.223	0.824

Significant at p-value < 0.05

KEY

X= Mean

SD= Standard deviation

BMI= Body Mass Index

Effects of Backpack bag on the Craniovertebral angle (CVA) of the Participants

Table 2 shows the values of the Craniovertebral angle of the participants that carried the backpack.

Paired t-tested showed that there was a significant difference (p=0.000) between the CVA of the participants without the backpack and when the backpack was carried with 15% load of their body weight.

Paired t-tested showed that there was a significant difference (p=0.000) between the CVA of the participants before carrying the backpack and when the backpack was carried with an additional load of 15% body weight with 5minutes walk.

Paired t-test showed that there was a significant difference (p=0.001) between the CVA of the participants when the backpack was carried with the additional 15% loading and when the backpack was carried with the 15% load of body weight with 5minutes walk.

Table 2: Effects of Backpack on the Craniovertebral angle (CVA) of the Participants

Variable	X±SD	t-value	p-value
CVA wt B	55.18±6.07	6.225	0.000*
CVA+15%BW	52.91±5.90		
CVA wt B	55.18±6.07	7.498	0.000*
CVA+15%BW+5mins walk	51.84±5.64		
CVA+15%BW	52.91±5.90	3.516	0.001*
CVA+15%BW+5mins walk	51.84±5.64		

*= Significant at p < 0.05

KEY

X= Mean

SD= Standard Deviation

CVA wt B= Craniovertebral angle without the Backpack

CVA+15%BW= Craniovertebral angle with Backpack plus an additional 15% bodyweight loading.

CVA+15%BW+5mins walk= Craniovertebral angle with Backpack with the 15% bodyweight loading and an additional 5minutes walk.

Effects of Messenger bag on the Craniovertebral angle (CVA) of the Participants

Table 4 showed the values of the Craniovertebral angle of the participants that carried the messenger bag.

Paired t-tested showed that there was a significant difference (p=0.000) between the CVA of the participants without the messenger bag and when the messenger bag was carried with 15% loading of their body weight.

Paired t-tested showed that there was a significant difference (p=0.000) between the CVA of the participants before carrying the messenger bag and when the messenger bag was carried with an additional load of 15% body weight with 5minutes walk.

Paired t-test showed that there was a significant difference (p=0.004) between the CVA of the participants when the messenger bag was carried with the additional 15% loading and when the messenger bag was carried with the 15% load of the body weight with 5minutes walk.

Table 4: Effects of Messenger bag on the Craniovertebral angle (CVA) of the Participants

Variable	X±SD	t-value	p-value
CVA wt M	55.96±5.47	4.457	0.000*
CVA+15%BW	54.51±5.49		
CVA wt M	55.96±5.47	5.308	0.000*
CVA+15%BW+5mins walk	53.36±5.47		
CVA+15%BW	54.51±5.49	2.924	0.004*
CV+15%BW+5mins walk	53.36±5.47		

*= Significant at p < 0.05

KEY

X= Mean

SD= Standard Deviation

CVA wt M= Craniovertebral angle without the Messenger Bag

CVA+15%BW= Craniovertebral angle with Messenger Bag plus an additional 15% bodyweight loading.

CVA+15%BW+5mins walk= Craniovertebral angle with Messenger Bag with the 15% bodyweight loading and an additional 5minutes walk

Comparison of the effect of Backpack and Messenger bag on the Craniovertebral angle of the Participants

The comparison between the effect of backpack and messenger bag on the Craniovertebral angle of the participants (Table 5 and Figure 22).

Paired t-test showed that there was no significant difference (p=0.336) between the CVA of the participants without carrying any of the two types of bags.

Paired t-test showed that there was a significant difference (p=0.048) between the CVA of the participants when they carried the two types of bags with an additional 15% of their body weights.

Paired t-test showed that there was a significant difference (p=0.054) between the CVA of the participants when they carried the two types of bags with an additional 15% of their body weights coupled with a five minutes' walk.

Table 5: Comparison of the effect of Backpack and Messenger bag on the Craniovertebral angle of the Participants

Variable	Backpack (n=100) X±SD	Messenger bag (n=100) X±SD	t-value	p-value
CVA wt B/M	55.18±6.07	55.96±5.47	-.965	0.336
CVA+15%BW	52.91±5.90	54.51±5.49	-1.991	0.048*
CVA+15%BW+5mins walk	51.84±5.64	53.36±5.47	-1.937	0.054*

*= Significant at $p \leq 0.05$

KEY

X= Mean

SD= Standard Deviation

CVA wt B/M = Craniovertebral angle without the Backpack/Messenger Bag

CVA+15%BW= Craniovertebral angle with Backpack/Messenger Bag plus an additional 15% bodyweight loading.

CVA+15%BW+5mins walk= Craniovertebral angle with Backpack/Messenger Bag with the 15% bodyweight loading and an additional 5minutes walk

Discussion

The main aim of this study is to compare the effect of backpack and messenger bag on the Craniovertebral angle of secondary school students in Lagos State.

The mean values for the age of the participants in this study fell among the average values for the adolescence age group which is from 10-19 years [24]. The BMI of the participants fell within the normal body weight. This may be because the age group that participated are students and they are young and active. This finding corroborates the result of the study by Odebiyi *et al*. [6] and Olubusola *et al*. [14] who carried out researches on secondary school students with similar age group. The result of this study revealed a range of 51.84˚- 55.96˚ of the Craniovertebral angle among the participants, and this corroborate the findings of the studies of Spechpt. [12] Rodrigo *et al*. [13] and Akodu *et al*. [10] who in their own studies reported a range of about 50˚ and above for a pain free Craniovertebral angle.

The findings from this study revealed that there was a significant difference in the CVA of the participants when the backpack was carried initially with 15% of their body weight and after five minutes' walk with the load, compared to when the angle was measured without any load. This finding agrees with the study carried out by Shivanda *et al. [19]* (2013), which states that carrying of heavy backpacks had a significant effect on the Craniovertebral angle. There was also a decrease in the CVA which causes more forward head protrusion causing a forward head posture. This finding is supported by several other researchers (Ramprasad *et al*, [23]; Hundekari *et al* [25]; Shivanda *et al* [19], Akodu *et al*, [10] who reported in their own studies that reduction in the CVA leads to a forward head posture.

The result of this study showed that there was a significant difference in the CVA of the participants when the messenger bag was carried initially with 15% of their body weight and after five minutes' walk with the load when compared to when the CVA angle was measured without any load. This also shows reduction in the CVA which predisposes adolescents to great risk of musculoskeletal disorders. This finding is supported by the result of the study of Akodu *et al*.[10] who reported that greater head protrusion leads to greater risk of neck musculoskeletal disorders.

The reason being that when this bags are carried with weight, collectively there is flexion of lower cervical spine, extension of upper cervical spine and increased thoracic kyphosis when compared without carrying these bags. [25]

When the CVA of the participants that carried the backpack and the messenger bags were compared, it showed slight significant difference when it was initially carried with 15% of their body weight, and after the five minutes' walk with the load. The CVA of the participants without

either of the backpack or messenger bag load showed no significant difference. This shows that the CVA of the participants before carrying the bags was normal but the loads caused significant changes in CVA leading to forward head protrusion and increased risk of musculoskeletal disorders. This agrees with the study of Odebiyi *et al.* [6] who reported that there was high prevalence of back pain among students due to the weights of their school bags. The reason being that when students carry their school bags, their center of gravity moves posteriorly due to the posterior load. The students body then tries to keep center of mass between the feet, so with a school bag load, the trunk is in more forward position which then causes a compensatory movement in the neck causing a forward head position and protraction of the shoulders which causes the students to look down. The students are then forced to extend the occiput to keep the eyes horizontal and look straight leading to the forward head posture [25]. It also agrees with the result of the study by Akodu *et al*. [10] who reported that greater head protrusion leads to greater risk of neck musculoskeletal disorders.

Findings from this study showed, that there was a significant difference between the participants when either of the backpack or messenger bag was carried and when the participant walked for 5minutes as well as when the participants were in an unloaded position. The CVA reduced after the participants carried the backpack or the messenger bag with 15% of their body weight for 5minutes, indicating that time carrying a load influences neck posture on upper trunk position. This result agrees with the result of the study by Shivanda *et al.* [19], who reported that loading the shoulder with backpack load changes adolescents' normal postural alignment.

Ramprasad *et al.* [23], reported that carrying bag loads of 15% of the body weight do not only affect the neck posture but also the head, trunk, and lower limb and affect overall posture. Also, carrying loads as low as 5% of the body weight causes significant changes in trunk and lower limb angles. These predispose students to loads of musculoskeletal deformities and conditions.

The results of this study shows that the participants still fall within the normal range of pain free CVA which is about 50° and above ([12, 13, 10]. However constant loading of the body with backpacks and messenger bag can cause adverse effects in the future if these children continually carry heavy loads to school regularly. Ramprasad *et al.* [23] reported that persistent forward head posture was found to be the major cause of many musculoskeletal disorders around neck and shoulder region in adults.

Also, when both bags were carried with 15% body weight there was a significant decrease in the CVA, this therefore implies that no matter the type of bags being carried by students, carrying bags weighing 15% of their body weight would be too heavy for secondary school students to maintain their normal postural alignment, in other words, carrying a bag of less than 15% of body weight could be recommended. This finding agrees with the result of the study by Mohamed *et al*, [16] who reported that a schoolbag should not be more than 5% of body weight among the female students and 10% of body weight among male students.

Conclusion

Based on the results from this study, the following conclusions and recommendations were made: The Craniovertebral angles of the participants were normal when neither the backpack nor the messenger bag load was carried. The Craniovertebral angle reduced significantly when the participants carried either the backpack or the messenger bag with an additional 15% of their body's weight. The Craniovertebral angle reduced significantly when the participants carried either the backpack or the messenger bag plus an additional 15% of their body's weight with a five minutes' walk. Both the loaded backpack and the messenger bag caused a significant change in the CVA of the participants when carried. No matter the type of school bags carried by students, heavy bags greater or equal to 15% of their body weight predispose them to lots of musculoskeletal deformities and conditions. It is therefore

recommended that school lockers should be made to store student's school books rather than carrying heavy bags filled with books to school daily.

Parents and guardians should restrict the amount of load carried by their wards to school. Students should be educated on the effects of carrying heavy school bags on their musculoskeletal system. Students should be educated on the appropriate way of carrying their school bags. Parents and guardians should be educated on the exact or correct weight to be carried by students or their wards to school which should be less than 15% of their body weight.

Limitations

The study was not allowed to be carried out in some schools because of the use of camera which was one of instrument used in this study.

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EFFICACY OF NERVE FLOSSING TECHNIQUE IN THE MANAGEMENT OF ACUTE SCIATICA

EFICIENȚA TEHNICII DE NERVE FLOSSING ÎN MANAGEMENTUL SCIATICII ACUTE

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Keywords: nerve flossing, sciatica, Siatica Bothersome Index

Abstract

Introduction: Sciatica is one of the most common painful and disabling conditions accounting for about 40% of low back pain cases hence the need for effective means to alleviate symptoms. Nerve Flossing Technique has been successfully used to manage neuropathic pain like carpal tunnel syndrome.

Aim: This study investigated the efficacy of nerve flossing technique (NFT) in the relief of symptoms of acute sciatica and the attendant functional disabilities.

Method: In this randomized control trial, 32 participants between the ages of 18 – 64 years with acute sciatica were randomly assigned into two groups; Group A (Study Group) received Nerve Flossing Technique (NFT) in addition to Conventional Physiotherapy and group B (Control Group) received only Conventional Physiotherapy. The outcome was assessed in terms of Numeric Pain Rating Scale (NPRS), Passive Straight Leg Raise (PSLR) and Sciatica Bothersomeness Index (SBI).

Result: Both groups had significant improvement in NPRS score ($p<0.01$), PSLR value ($p<0.01$) and SBI score ($p<0.01$). However, comparing the mean changes in the outcome measures between the two groups showed that the study group had significant ($p<0.01$) changes in all outcome measures when compared to the control group.

Conclusion: NFT combined with conventional physiotherapy has a better effect on the management of acute sciatica and should be an

Cuvinte cheie: nerve flossing, sciatică, Sciatica Bothersome Index

Abstract

Introducere: Sciatica este una dintre cele mai dureroase şi debilitante condiţii, fiind responsabilă de 40% din cazurile de dureri de spate, de unde şi necesitatea unor mijloace eficiente de ameliorare a simptomelor. Tehnica Nerve Flossing a fost folosită cu success pentru managementul durerii neuropatice, precum sindromul de tunel carpian.

Scop: Acest studiu doreşte să evidenţieze eficienţa aplicării tehnicii nerve flossing (NFT), în ameliorarea simptomelor de sciatică acută, precum şi ameliorarea disabilităţilor funcţionale aferente.

Metodă: La acest studiu randomizat, au participat 32 subiecţi, vârse între 18 – 64 ani, suferind de sciatica severă, care au fost distribuiţi aleatoriu în două grupuri; la grupul A (de studiu) s-a folosit tehnica Nerve Flossing (NFT) şi kinetoterapie convenţională şi la grupul B (de control) s-a folosit doar kinetoterapie convenţională. Rezultatele s-au evaluat cu ajutrul Scalei Numerice a Durerii (NPRS), Straight Leg Raise Pasiv (PSLR) şi Indexul Sciatica Bothersomeness (SBI).

Rezultate: Ambele grupuri au prezentat îmbunătăţiri semnificative ale scorurilor NPRS ($p<0.01$), PSLR ($p<0.01$) şi SBI ($p<0.01$). Dar, la compararea valorilor medii dintre cele două grupuri s-a observant că grupul de studiu a prezentat modificări semnificative ($p<0.01$) ale paramerilor evaluaţi, faţă de grupul de control.

Concluzii: NFT combinat cu kinetoterapia convenţională are un effect mai bun în tratamentul sciaticii acute şi de aceea ar trebui să fie o componentă integrată în mangementul kinetoterapeutic al acestei afecţiuni.

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Introduction

Sciatica is a set of symptoms which includes radiating pain, tingling sensation, numbness and weakness along the distribution of the sciatic nerve, that may be caused by compression and/or irritation of one or more of the five sciatic spinal nerve roots in one or both lower limbs.[1,2,3] The prevalence of sciatica varies from 1.6% in the general population to 43% in a selected working population.[4,5,6] Although the prognosis is good in most patients, a substantial proportion continues to have pain for 1 year or longer.[7,8]

Physiotherapy treatment of acute sciatica includes cold therapy, rest, manual therapy (spinal manipulation and soft tissue mobilization) and electrotherapy,[9] core muscle strengthening, stretching of tight structures, mechanical traction. [10] However, there are still contentions on the Physiotherapy treatment protocols which produce a rapid improvement in patients with sciatica [9,11] though a systematic review [12] reported that exercises seemed not to produce therapeutic benefits. However, it is yet to be ascertained if Nerve Flossing Technique (NFT), can improve sciatic nerve function thereby decreasing pain, sensory symptoms, functional disability and prevent the need for surgery, since it has been shown to be a cost effective option in the management of other conditions.[12, 13,14,15]

Nerve flossing involves movement of peripheral nerves from a mean position along its bed [16] and can be initiated from either one or both ends of the nerve bed. It has been shown that significantly less nerve excursion occurs during nerve flossing exercise initiated from one end of the nerve bed using a single joint movement, compared with nerve flossing initiated from both ends of the nerve and with multiple joints [16]. However, the underlying mechanisms associated with clinical improvements following nerve flossing technique remain unclear [17].

There are many theories that have been postulated, including physiological effects (removal of intraneural oedema), central effects (reduction of dorsal horn and supraspinal sensitization) and mechanical effects (enhanced nerve excursion).[16,17,18]

It is anticipated that nerve flossing technique (sliders) might be effective in the management of NFT and sciatica and acute sciatica, since it has been shown to be effective in the management of neuropathic conditions like carpal tunnel syndrome, [19] low back pain [15] and other radiculopathies.[20,21] A couple of recent studies [11,22] recommend investigations also into the therapeutic efficacy of NFT in lower limb radiculopathies such as sciatica, to enhance the wide application of the technique.

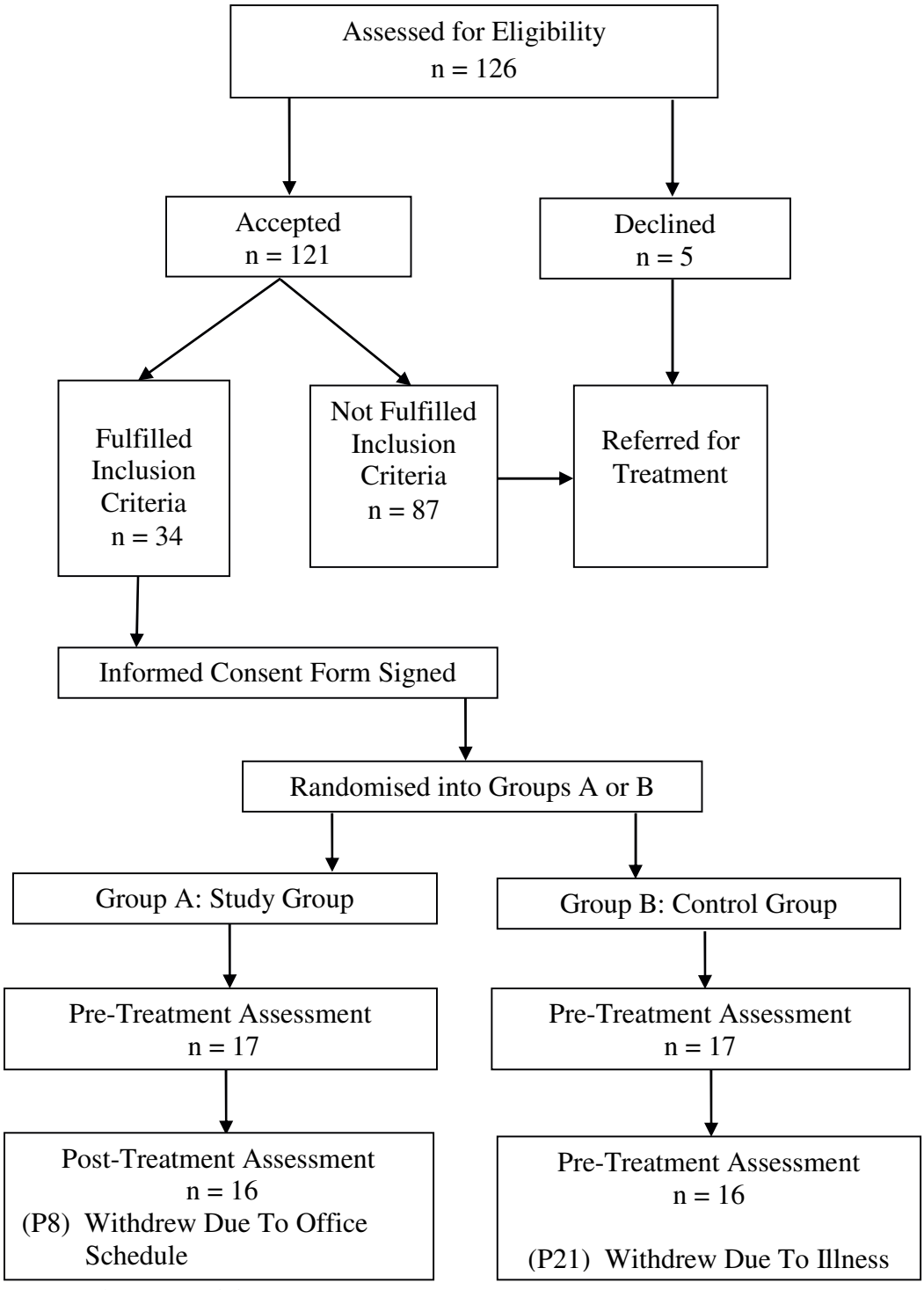
Purpose

Nerve Flossing Technique has also been shown to be a safer and cost effective conservative treatment option [13, 14, 15]. However, there is dearth of evidence on its use in the management of acute sciatica. This study is therefore aimed at investigating the therapeutic efficacy of nerve flossing technique in the management of acute sciatica.

Materials and Methods

Subjects

A total of 76 patients presenting with sciatica were invited to participate in the study. 71 patients accepted to participate, while 5 declined to participate in the study. Thirty-seven patients were found ineligible for the study after screening and were therefore excluded. Each group had 17 participants from the 34 eligible patients. However, only 16 participants from each of the groups completed the study. Reasons for withdrawal by the 2 participants who did not complete the study were as given in figure 1.



n = Sample; P = Participant

Figure 1: Flow diagram for participant recruitment and randomization

Participants included in the study were those presenting with Sciatica (acute stage), due to intervertebral disc pathology as seen in the Radiologist report, participants with positive Passive Straight Leg Raise (PSLR) Test (30^0-70^0). [23] Those with positive Flip Sign - trunk extension from sitting in an attempt to fully extend the target knee [24] and those with only sensory symptoms of sciatica like radiating pain, tingling and numbness. The Participants included only those who suspended pain relieving drugs for the period of the study. Excluded were participants who have had lumbar spine surgery within the last 12 months and anyone who had sciatica along with muscular weakness, vascular disorders, diabetic neuropathy, tumour and fractures. Also excluded were those with underlying spinal pathology and acute ligament injury and participants with clinical situations where Cryotherapy, TENS and back extension exercise are contraindicated.

The outcome measures were the Numeric Rating Scale (NRS), the Sciatica Bothersomeness Index [25] and the range of movement (ROM) of hip flexion as determined by the passive straight leg raise (PSLR).

Sciatica Bothersomeness Index (SBI): This is a composite score of four questions about back and leg symptoms: (1) Leg pain; (2) Numbness or tingling in the leg, foot or groin; (3) Weakness in the leg or foot and (4) Back or leg pain while sitting.[25] Scores are in the range of 0 to 6 for each question (0 = not bothersome to 6 = extreme bothersome). The total score ranges from 0 to 24, and a higher score indicate worse pain. Test-retest reliability has been reported for a Norwegian translation of the SBI with intra-class correlation coefficient = 0.88, 95% confidence interval = 0.82–0.92. [26]

A simple random sampling technique was used to assign participants into 2 groups (groups A and B). This was done in phases, through balloting, with each participant picking a slip of paper in a ballot box containing equal numbers of paper slips marked either 'A' or 'B'. The sample size for this study was determined using the mathematical relationship as described by Cohen (1988) [27], in which the minimum sample size for each of the groups was determined to be 13 participants.

Ethical approval was sought and obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Idi-Araba and the National Orthopaedic Hospital Igbobi, Lagos. All participants gave written informed consent

Assessment

Participants were assessed with detailed history taken and physical examination carried out to confirm Sciatica. The confirmation of sciatica was done with a positive Passive Straight Leg Raise between 30° to 70°,[23] positive Flip Sign (trunk extension from sitting in an attempt to fully extend the knee),[24] pain at the back (L_4 to S_3) during digital pressure and radiologist report. They were further screened based on the inclusion/exclusion criteria. Information relating to age, gender, occupation, height, weight and target/affected lower extremity – the more symptomatic or sciatic lower extremity (for participants with bilateral lower sciatic extremity) were obtained. Adopting the protocol of Akinbo *et al.* (2011),[28] the dominant lower extremity was chosen as the target/affected extremity for participants with similar severity of bilateral symptoms. Lower limb dominance was resolved following the protocol of Fabunmi and Gbiri (2008),[29] by asking the participants to detect the limb with which they: (a) kick a ball with, (b) lead with while climbing stairs (c) lead with from a standing still position. Participants were later asked to demonstrate (b) and (c) above.

Participants were briefed about the nature of the study, effect and benefit of participation. They were encouraged to clarify issues regarding the study if any. Written Informed Consent was then obtained.

Means

Participants were then randomly assigned into two groups; Study (Group A) and Control (group B) respectively. Nerve Flossing Technique was thereafter demonstrated to the study

group alone. Passive Straight Leg Raise (hip flexion range) value, numeric pain rating scale and Sciatica Bothersomeness scores of the participants were measured /recorded prior to intervention.

Reassessment was done after 2 weeks of six treatment sessions, with all treatment starting on a Monday.

Study group (Group A) received Cryotherapy for 10 minutes on the back, Soft Tissue Manipulation at the painful areas for 5 minutes, Back extension exercises in prone lying (affected lower extremity raised with ipsilateral full knee extension) for 10 repetitions by 5 seconds hold and 5 seconds relax, Transcutaneous Electrical Nerve Stimulation (TENS) for 15 minutes and Nerve Flossing Technique.

The Nerve Flossing Technique was performed actively with the participant sitting on a chair. Adopting the protocol of Pallipamula and Singaravelan (2012) [11], the participant flexed the knee of the target lower extremity backwards beside the chair, as far back as possible and flexed the neck at the same time, holding both the flexed knee and neck in this position for 5 seconds. The participant in turn extended the neck and the knee of the target lower extremity, abducted and flexed the hip until pain was felt and did not push beyond that point. This extended position was equally maintained for 5 seconds. The procedure (Nerve Flossing Technique) was repeated 15 times, for 3 sets with an interval of 5 minutes between each set. However, as the nerve became less sensitive, the participant increased the stretching effect by dorsiflexing the ankle and extending the toes of the foot upward towards the shin.

The Control (Group B) Group received all the procedures above except the Nerve Flossing Technique. Participants in both groups received the above treatment plan 3 times weekly for 2 weeks. All the participants were advised to remain as active as possible.

The post treatment protocol used by Akinbo *et al.,* (2007) [28] was adopted, in which post-test evaluation was performed three days after completion of the last final treatment session. This was to avoid the immediate effect of treatment on results. The data, thus obtained was considered for statistical analysis.

Statistical Package for Social Science (SPSS) 20 for windows package program was used to analyse data. All demographic and quantitative data were expressed as mean ± standard deviation (SD). Descriptive statistics of bar chart and percentage was used to present gender, body weights, heights, occupation and target extremity distribution in the two groups.

Paired sample t-test was used to compare the pre-intervention and post-intervention changes in outcome measure variables in each group (group A and B) while independent t-test was used to compare the mean changes between the two groups. All statistical tests were performed at the 0.05 level of significance ($p \leq 0.05$).

Results

A total of 34 participants were eligible for the study after screening, with each group having 17 participants. However, only 16 participants from each of the groups completed the study and their findings were analysed. This gives an attrition rate of 0.06%. Seven (43.8%) out of 16 participants in the study group (Group A) were males while 9 (56.3%) were females. In the control group (Group B), 6 (37.5%) were males and 10 (62.5%) were females. The analysis showed that 9 (62.5%) out of the 16 participants in the study group had their right lower limb as the affected/target (sciatic) limb and 7 (43.8%) had their left lower limb as the affected/ target (sciatic) limb. Six (37.5%) out of 16 participants in the control group had their right lower limb as the affected/ target (sciatic) limb while 10 (62.5%) participants had their left lower limb as the affected/ target (sciatic) limb.

Table 1 describes the baseline characteristics of the participants in both groups and it is seen that there was no significant differences in the parameters.

Table 1: Physical and Baseline Characteristics of Participants in both Groups

Characteristics	Parameters	Study Group x± SD	Control Group x± SD	t-value	p-value
Physical Characteristics					
	Age (years)	53.50 ± 8.65	51.87 ± 10.29	0.483	0.632
	Height (m)	1.66 ± 0.07	1.63 ± 0.09	1.005	0.323
	Weight (kg)	71.88 ± 9.86	72.44 ± 8.32	-0.174	0.863
	BMI (kg/m^2)	26.21 ± 4.46	27.39 ± 4.11	-0.780	0.441
Baseline Characteristics					
	Pre- NPRS	8.56 ± 1.09	8.00 ± 1.55	1.187	0.245
	Pre- PSLR(°)	45.00 ± 5.54	45.38 ± 9.32	0.138	0.891
	Pre- SBI	13.75 ± 2.96	12.44 ± 3.27	1.192	0.243

Key
BMI = Body Mass Index
Pre- NPRS = Pre Numeric Pain Rating Scale
Pre- PSLR = Pre Passive Straight Leg Raise
Pre- SBI = Pre Sciatica Bothersomeness Index

In table 2, the intra group comparison of outcome measures pre and post intervention in the study and control groups showed significant differences between the pre and post treatment scores of numeric pain rating scale, hip flexion range of motion and Sciatica Bothersomeness Index of participants in the both groups.

Table 2: Comparison of Outcome Variables Pre- and Post- Intervention within the Groups

Groups	Outcome Variables	Pre-Intervention X±SD	Post-Intervention X±SD	t-value	p-value
Study Group	NPRS	8.56±1.09	1.81±1.60	13.851	<0.001*
	PSLR(°)	45.00±5.54	71.13±3.67	-16.554	<0.001*
	SBI	13.75±2.96	2.81±2.32	10.256	<0.001*
Control Group	NPRS	8.00±1.55	4.19±1.42	9.527	<0.001*
	PSLR(°)	45.38±9.32	61.50±6.76	-8.641	<0.001*
	SBI	12.44±3.27	7.31±3.40	14.556	<0.001*

*Significance at p≤0.05
Key
NPRS = Numeric Pain Rating Scale
PSLR = Passive Straight Leg Raise
SBI = Sciatica Bothersomeness Index

Table 3 compares the differences in the pre and post-intervention outcome measures between the study group and control group. There was a highly significant difference between the study group and control group in the numeric pain rating scale, hip flexion range of motion and sciatica Bothersomeness index scores.

Table 3: Comparison of the Mean Changes in Outcome Measures between the Groups

Outcome Measures	Study Group X± SD	Control Group X± SD	MD X± SD	t-value	p value
NPRS	-6.75±1.95	- 3.81±1.60	-2.94±0.63	4.658	<0.001*
PSLR	26.13±6.31	16.13±7.46	10.00±2.44	4.092	<0.001*
SBI	10.94±4.27	5.13±1.41	-5.81±1.12	5.176	<0.001*

*Significance at p≤0.05

Key

NPRS = Numeric Pain Rating Scale

PSLR = Passive Straight Leg Raise

SBI = Sciatica Bothersomeness Index

MD= Mean Difference

Discussion

The purpose of this study was to investigate the efficacy of nerve flossing technique (NFT) in the management of acute sciatica. There were no significant differences in the baseline and physical characteristics of the participants in the two groups (table 1). The results of this study show a significant improvement in the outcome parameters in both the study and control groups (table 2). This could be attributed to the effects of the modalities used for the conventional physiotherapy treatment protocol. In the control group, there was significant reduction in pain and subsequent increase in PSLR [10] which eventually resulted in lower SBI scores. These effects could be due to stimulation of mechanoreceptors within the joint capsule as well as the use of Transcutaneous Electrical Nerve Stimulation (TENS) in pain modulation [30]. This is because both movement and TENS may help control pain at the level of the central nervous system. In the gate control theory [11, 30] stimulation of mechanoreceptors within the joint capsule and surrounding tissues causes an inhibition of pain at the spinal cord.

The significant pain reduction could also be directly associated with the cryotherapy-induced reduction in the neurogenic inflammation. This indicates that participants in the control group that had only conventional physiotherapy equally improved in terms of the entire outcome parameters. This improvement might have been due to the therapeutic gains accompanying conventional Physiotherapy, since it is the currently acceptable, widely used treatment protocol in the management of sciatica. These findings agree with the study o; Pallipamula and Singaravelan (2012) [11] and Sarkari and Multani (2007) [20] which ascertain the efficacy of neural mobilisation in sciatica.

In table 3, a comparison of the differences between the pre-treatment and post-treatment values of the outcome measures between the control group and the study group that had nerve flossing in addition to conventional physiotherapy showed that NFT resulted in a better effect in the management of acute sciatica. This result agrees with the findings of some previous studies, [11, 31] though, none of them worked on acute sciatica. Similar results have equally been produced using NFT in the management of Carpal Tunnel Syndrome, [19, 31] Low Back Pain [15] and in Cervicobrachial neurogenic pain. [33] The pain and dysfunction associated with sciatica has been suggested to be a result of mechano-sensitivity which refers to the generation of impulses in response to mechanical stress by the neural tissue [34,35] which in turn trigger the activation of nociceptive ectopic signals in sensitized neural tissue. Mechano-sensitivity is a normal physiological response which is considered a defense mechanism of the nervous system. [34]

Since a peripheral nerve must move in order to function properly [36] many authors have suggested that one of the primary benefits of nerve flossing is to promote nerve excursion in order to break down neural fibrosis and tethering, and thus restore optimal nerve mobility.[17, 37]

These effects of NFT may therefore be due to restoration of neural physiology which causes a dynamic variation in neural pressure (by stretching at one end and relaxing at the other

end), hence leading to evacuation of intraneural edema which might be present in acute sciatica. [22, 34, 38]

This technique may also help to oxygenate the nerve, by causing neurovascular effleurage and increase in neural perfusion, thereby decreasing ischemic pain and promoting axonal transport.[11] In addition, it is hypothesized that the movement of nerve within pain-free variations can help reduce nerve compression, tension and friction therefore decreasing its mechanosensitivity.[39]

Our findings suggest that for effective reduction of sciatic pain and improvement in functional ability, NFT should be combined with conventional Physiotherapy as reported by previous studies [11, 21, 40] as the combination of NFT and conventional Physiotherapy protocol appears to produce a synergistic effect. The advantage of NFT is that it is cost-effective and can be given as home program for the patient in order to optimize therapeutic gains.

Conclusion

NTF combined with conveal physiotherapy has a better effect on the management of acute sciatica. Nerve Flossing Technique is efficacious in the management of acute sciatica and should be an integral component of Physiotherapy management. There is however the need to replicate this study with larger sample sizes in order to validate these results

Further studies could be done to determine the effect of Nerve Flossing Technique in the management of chronic sciatica.

Conflict of Interest

The authors report no conflicting interest; financial or otherwise

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EFFECTIVENESS OF FIVE PHASE BALANCE TRAINING PROGRAM ON THE RISK OF KNEE INJURIES IN ADOLESCENT ATHLETES

EFICIENȚA UNUI PROGRAM DE REEDUCARE A ECHILIBRULUI ÎN CINCI FAZE ASUPRA RISCULUI DE ACCIDENTARE A ATLEȚILOR ADOLESCENȚI, LA NIVELUL GENUNCHIULUI

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Key words: knee injuries, rehabilitation, balance training program, injury prevention, fall prevention, high school athletes

Abstract

Back ground & Objectives: Knee injuries pose serious health burdens to athletes of all ages in nearly every sport. They account for 15.2% of all high school sports injuries, often requiring expensive surgical treatment and prolonged time lost from school and sports participation males accounted for 72% and females for 28%; 65% of the injuries occurred during sports activities**.**

Objective: The main objective of the study is to find out the effect of five phase balance training on reducing the risk of knee injuries and association between the injury rate with the baseline characteristics in adolescent athletes.

Methods: Subjects fulfilling the inclusion and exclusion criteria were included in the study and base line data is considered and subjects were divided into control and experimental group, the experimental group carried out balance training program 5 days per week, for 5 weeks. Control group will be advised to continue their training with warm up program and home-based balance-training program using a wobble board.

Results: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD. sample distribution for lyshlom knee score after intervention which were statistically significant ($p<0.006$) in group-A compared to group-B. For lyshlom knee score after intervention between groups the SD for group-A was 84.02±8.73 and group-B was 79.54±8.62 with p value 0.006.

Conclusion: Five phase balance training program is effective on the risk of knee injuries and there is no significant association between injury rates and baseline characteristics in adolescent athletes.

Cuvinte cheie: leziuni de genunchi, reabilitare, program de reeducare a echilibrului, prevenirea accidentărilor, sportivi de liceu

Rezumat

Introducere: Leziunile de genunchi produc serioase probleme sportivilor de toate vârstele în viața sportivă zilnică. Ele totalizează 15.2% dintre toate leziunile sportive ale liceenilor, adesea necesitând tratament chirurgical costisitor și absențe lungi de la școală și activitățile sportive, accidentările la băieți fiind în proporție de 72% și la fete de 28%; 65% dintre leziuni se produc în timpul activităților sportive.

Obiective: Principalul obiectiv al acestui studiu este de a stabili efectul unui program în cinci faze de reeducare a echilibrului, în reducerea riscului de accidentări la genunchi și asocierea dintre rata accidentărilor și caracteristicile de bază ale sportivilor adolescenți.

Metodă: Subiecții care au îndeplinit criteriile de includere și excludere au fost introduși în studiu; s-au obținut datele inițiale și subiecții au fost împărțiți în grupul experimental și cel de control. Cel experimental a urmat programul de reeducare a echilibrului 5 zile pe săptămână, timp de 5 săptămâni. Grupul de control a fost sfătuit să își continue antrenamentul cu încălzire și antrenarea echilibrului acasă, pe placa de echilibru.

Rezultate: S-a realizat analiza descriptivă și inferențială. Rezultatele la evaluări sunt prezentate sub formă de medie și ab.std. Distribuția eșantioanelor pentru Lyshlom knee score după intervenții a fost smnificativă statistic ($p<0.006$) la gupul-A comparativ cu grupul-B. Pentru Lshlom knee score după intervenții comparat între cele două grupuri, media și ab.std pentru group-A a fost 84.02±8.73 și pentru grupul B a fost 79.54±8.62, valoarea p de 0.006.

Concluzii: Antrenarea echilibrului prin programul în cinci faze este eficient pentru reducerea riscului de accidentări la genunchi. Nu există asocieri semnificative între rata accidentărilor și caracteristicile de bază ale sportivilor adolescenți.

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Introduction

Knee injuries pose serious health burdens to athletes of all ages in nearly every sport. They account for 15.2% of all high school sports injuries, often requiring expensive surgical treatment and prolonged time lost from school and sports participation. One international study reports youth athlete knee injury rates, but these may not represent US high school injury patterns because of country-specific differences in sport availability and participation. Previous studies describing US high school sports-related knee injuries reported high rates of knee injuries, high proportions of knee injuries compared to other injuries, increased risk of re injury, and high numbers of knee injuries requiring surgical treatment, but these were limited in geographic region, described injury patterns in general but not in detail, or did not report injury patterns across a large number of sports. Multiple studies have investigated knee injury patterns by gender, frequently reporting that knee injury rates are higher in female athletes but few studies have directly compared knee injury rates and patterns in both gender-comparable and gender-specific sports. [1]

Although the medial collateral ligament is the most commonly injured ligament, the anterior cruciate ligament (ACL) is the most frequently injured single ligament associated with limited range of motion. [2] More ACL injuries are the requiring surgery, 60.3% were to the knee. [3] The ligaments surrounding the knee joint offer stability by limiting movements and together with several menisci and bursae protect the articular capsule. [1] Biomechanical risk factors summarized by the consensus panel included the effect of the total chain (trunk, hip, knee& ankle) on ACL injuries, awkward or improper dynamic body movements, deceleration and change of direction and neuromuscular control of the joint. [4]

Balance is an ability to maintain the center of gravity of the body with the base of support with minimal postural sway. [5] Balance is a component of all movements, regardless of whether strength, speed, flexibility or endurance dominants the movement. Maintenance of postural equilibrium or balance is a process requiring optimal muscular balance (length tension relationship), joint dynamic (arthrokinematics) and neuromuscular efficiency.

Balance training should constantly stress an individual's limits of stability. Balance training is an effective tool in the prevention of falls. [6] Balance training to stimulate neuromuscular control. Proprioception is mediated by sensory receptors in the skin, musculotendinous unit, ligaments, and joint capsule. [7,8] However, there is the potential that these types of training programs may also be beneficial for decreasing the risk of lower extremity injuries, including knee injuries in the adolescent athletes.

Balance training programs is used in the rehabilitation of sports related injuries and is becoming recognized as an important element in injury prevention of sports. Running, jumping or pivoting on one leg relies on a sense of joint position and muscular control for joint stability.

There is evidence that static balance improves following proprioceptive balance training using a wobble board.

Many balance training programs have been suggested for ACL injuries and there is absence of neuromuscular control of the knee joint may be responsible for the increased rates of knee injury in athletes. [10] Sport participation and injury rates in child and adolescent sport are high[13] and majority of the studies focuses on improving the balance and to improve proprioception. Hence the study is intended to find out the risk of knee injuries in athletes.

Materials and Methods

A descriptive study is conducted among 100 subjects in and around sports clubs of bangalore inclusion criteria subjects were in the age group between 15 – 2 0 years of age without any injuries and those with fractures around the knee joint and fat pad impingement and previous surgeries in the lower limb were excluded from the study . Informed consent was taken from subjects meeting inclusion and exclusion criteria. Subjects were screened and base line data like gender, age, height, weight, leg dominance, use of knee supports, knee laxity were obtained.

Height was measured with a stadiometer. Weight was measured on digital platform scale. Leg dominance was determined by asking the subject his or her dominance for kicking a ball.

Knee ligament laxity was determined by performing anterior drawer test on the knee with subject in a supine lying with slight knee flexed. Subjects were divided into control and experimental groups using simple random sampling.

Methodology

The experimental group was given "Balance Training Programme" 5 days per week, for 5 weeks.

The exercise program includes:

1) Maintaining a single leg stance on a flat surface with eyes open and closed.
2) Performing functional sport activities such as throwing, catching, and dribbling on one leg;
3) Maintaining double-leg stance while rotating the balance board;
4) Maintaining a single-leg stance on the balance board with eyes open and closed; and
5) Performing functional sport activities while in single-leg stance on the board.

The balance Board that was used consisted of a wooden disk 16 inches in diameter with a 4-inch half Sphere attached to the bottom. The sphere allowed approximately 17° of angulations in all Planes. If subjects who are not participating consecutive balance training sessions, he or she will Considered as noncompliant with the balance training protocol.

Control group was advised to continue their training with warm up program and home-based balance-training program using a wobble board, included warm-up, flexibility, jump training, strength training, rehabilitation and sport-specific technical components. 30 onsite athletic trainers were record athlete exposure and sprains after 6months and percentage of injury rate was calculated by the score of lysholm knee scale between experimental and control groups and according to baseline characteristics

Data analysis

Descriptive analysis was performed by SPSS (Version13) for windows; Alpha value was set as .05. Descriptive statistics was performed to find out the Mean, SD, Range for demographic variables such as height, Weight and BMI, leg dominance and outcome variable such as Lyshlom knee score. Mann Whitney U test was used to find out significant differences between the groups after intervention for outcome variables such as lyshlom knee score.

Chi-square test was used to analyze gender difference, leg dominance, knee support, knee laxity between groups. Fisher exact test was used to find out significant difference on categorical scale between groups.

Fisher exact test was used to find out significance between No of subjects who scored <=65 on Lyshlom knee score and No of subjects who scored more than 65 on Lyshlom knee score among both groups.

Microsoft word and Excel have been used to generate graphs, tables etc.

Results

Table -1 Base line Data for Demographic variable

variable	Group-1	Group-2	P value
Age	15.86±2.44	16.02±2.82	>0.763
Height	161.26±14.21	160.22±18.69	>0.755
Weight	51.64±10.57	52.92±11.75	>0.568
BMI	19.86±3.37	20.64±3.42	>0.251

Age:

The above table shows the descriptive statistics for demographic variables of age as shown in figure. Mean age of group-1 is 15.86±2.44 and group-2 is 16.02±2.82 P value of >0.763.

Height:
The above table-1 shows the descriptive statistics for demographic variables of Height as shown in figure. Mean Height of group-1 is 161.26±14.21 and group-2 is 160.22±18.69. P value of >0.755.

Weight:
The above table-1 shows the descriptive statistics for demographic variables of weight as shown in figure. Mean Weight of group-1 is 51.64±10.57 and group-2 is 52.92±11.75. P value of >0.568.

BMI Kg/m2:
The above table-1 shows the descriptive statistics for demographic variables of BMI Kg/m2 as shown in figure. Mean Weight of group-1 is 19.86±3.37 and group-2 is 20.64±3.42. P value of >0.251.

Table 2: Age distribution of patients studied

Age in years	Group I		Group II	
	No	%	No	%
10-12	5	10.0	8	16.0
13-16	23	46.0	16	32.0
17-20	22	44.0	26	52.0
Total	50	100.0	50	100.0

Table-2 represents the age 10 – 12yrs for group-1 five (10%) participants and group- 2, 8 (16%) participants. The age 13-16yrs for group-1, 23 (46%) participants and group-2, 16 (32%) participants. The age 17-20yrs for group-1, 22(44%) participants and group-2, 26 (52%) participants. But the samples for age distribution are not significant (p>0.763).

Table 3: Gender distribution of patients studied

Gender	Group I		Group II	
	No	%	No	%
Male	40	80.0	42	84.0
Female	10	20.0	8	16.0
Total	50	100.0	50	100.0

Table-3 represents the gender, males for Group-1, 40 (80%) participants and Group-2, 42 (84%) participants. According to the gender, females for group-1, 10 (20%) participants and group-2, 8(16%) participants. But samples for gender distribution which was not significant (p> 0.795).

Table-4 represents participants with <18.5BMI kg/m2 in group-1 were 16(32%) and in group-2 were 11 (22%) participants. Participants with 18.5 – 25.0BMI kg/m2 in group-1 were 32 (64%) and in group-2 were 36 (72%) participants. Participants with 25.0 – 30.0 BMI kg/m2 in group-1 were 1 (2%) and in group-2 were 1 (2%) participants. Participants with >30.0 BMI kg/m2 in group 1 were 1 (2%) and group-2 were 2 (4%) participants. But the sample distribution for BMI kg/m2 which were statistically not significant (P >0.251).

Table 4: Comparison of BMI kg/m2 in two groups of patients studied

BMI kg/m2	Group I		Group II	
	No	%	No	%
<18.5	16	32.0	11	22.0
18.5-25.0	32	64.0	36	72.0
25.0-30.0	1	2.0	1	2.0
>30.0	1	2.0	2	4.0
Total	50	100.0	50	100.0

Table 5: Comparison of Leg dominance in two groups of patients studied

Leg dominance	Group I		Group II	
	No	%	No	%
Left	3	6.0	4	8.0
Right	47	94.0	46	92.0
Total	50	100.0	50	100.0

Table-5 represents left leg dominance in group-1 were 3 (6%) participants and group- 2 were 4 (8%) participants. Right leg dominance were in group-1 were 47 (94%) participants and group-2 were 46 (92%) participants. But the sample distribution for leg dominance which was not significant (p= 1.000).

Table 6: Comparison of Use of knee supports in two groups of patients studied

Use of knee supports	Group I		Group II	
	No	%	No	%
Left	50	100.0	48	96.0
Right	0	0.0	2	4.0
Total	50	100.0	50	100.0

Table-6 represents participants not using left knee supports in group-1 were 50 (100%) and in group-2 were 48 (96%) participants. Participants not using right knee supports in group-1 were 0 (0%) and in group-2 were 2 (4%) participants. But the samples distribution for not using of knee supports which were statistically not significant (p= 0.495).

Table 7: Comparison of Knee laxity in two groups of patients studied

Knee laxity	Group I		Group II	
	No	%	No	%
No	50	100.0	50	100.0
Yes	0	0.0	0	0.0
Total	50	100.0	50	100.0

Table-7 represents with no knee laxity group-1 were 50 (100%) and in group-2 were 50 (100%) participants. Participants with no knee laxity group-1 were 0 (0%) and in group-2 were 0 (0%) participants. But sample distribution for no knee laxity which was statistically not significant (p=1.000).

Table 8: Comparison of Lyshlom knee score in two groups of patients studied (Balance training)

Lyshlom knee score	Group I		Group II	
	No	%	No	%
98 – 100	1	2	0	0
93 – 97	8	16	2	4
82 – 92	24	48	26	52
66 – 81	16	32	18	36
<= 65	1	2	4	8

Table-8 represents the lyshlom knee score for group-1 <=65 were 1 (2%) and for group-2 were 4 (8%) participants. The lyshlom knee score for group-1 66 – 81 were 16 (32%) and for group-2 were 18 (36%) participants. The lyshlom knee score for 82 - 92 group-1 were 24 (48%) and for group-2 were 26 (52%) participants. The lyshlom knee score for 93 - 97 group-1 were 8 (16%) and for group-2 were 2 (4%) participants. The lyshlom knee score for 98 - 100 group-1 were 1 (2%) and for group-2 were 0 (0%) participants. But sample distribution for lyshlom knee score which were statistically not significant (p>0.158).

Table 9: Comparison of Interpretation in two groups of patients studied

Results	Group I		Group II	
	No	%	No	%
Absent	49	98.0	46	92.0
Present	1	2.0	4	8.0
Total	50	100.0	50	100.0

Table-9 represents for group-1 were 49 (98%) participants were absent and for group- 2 were 46 (92%) participants were absent. For group-1 were 1 (2%) participants were have injury and in group-2 were 4 (8%) participants were have injury. But sample distribution for interpretation which were statistically not significant (p>0.362).

Table 10: Comparison of study variables in two groups of patients studied

Variables	Group I	Group II	P value
Lyshlom knee score	84.02±8.73	79.54±8.62	<0.006

Table-9 represents for Lyshlom knee score the SD for group-1 was 84.02±8.73 and group-2 was 79.54±8.62 with p value 0.006.

Discussion

In this study objective was to find out the association between the injuries rates with the baseline characteristics in adolescent athletes. The results of this study document that a simple, inexpensive, balance training program performed during a sport season will reduce the rate of knee injuries among athletes.

The baseline data of the demographic and outcome variables did not show any statistically significant difference between the patient populations in both groups. All patients in the both groups were able to complete the study. Baseline data studies are age, gender, BMI, leg dominance, use of knee support, and knee laxity. This insignificance accordance with studies showed overall, girls and boys sustained ankle/foot (35.9% and 43.2%, respectively), knee (18.2% and 10.6%, respectively), head/face/neck (14.2% and 12.8%, respectively), lower arm/hand (9.5% and 9.4%, respectively), and hip/thigh/upper leg (8.7% and 8.2%, respectively) injuries most often. Girls were more likely to injure a knee (IPR, 1.71; 95% CI, 1.27- 2.30; *P*

<.01), although the most comprehensive study to date found no gender differences in high school basketball injury rates. [3, 12, 15, 17] Knee laxity did not show any statistical difference.[13, 14]

It was hypothesized that, as a direct result of muscular fatigue or secondary to increased joint laxity, subjects would demonstrate aberrations in joint proprioception and alterations in joint-stabilizing muscle activity. Increases in joint laxity subsequent to exercise are suggested to be primarily due to the fact that joint structures, particularly the ligaments, exhibit viscoelastic characteristics. Ligaments are composed of collagen and other structural proteins, and, therefore, when stressed, respond in a time-dependent and stress-dependent manner. [30]

In experimental group balance training program were given this is followed with the methodology given by Timothy A et al. [8, 9]In the Group A Lyshlom knee scale score shows better result, out of 50 subject 1 subject fall under <=65, and 16 subjects fall under score between 66-81and 24 subjects fall under score between 82-92 and 8 subjects fall under score between 93-97 finally 1 subject fall under 98-100 but this is when compared to group B Lyshlom score out of 50 subjects 4 fall under score <=65 and 18 subjects fall under score between 66-81and 26 subjects fall under score between 82-92 and 2 subjects fall under score between 93-97 and finally only 1 subject fall under the score of 98-100 which was statistically not significant ($p > 0.158$). [28]

Group A got greater score lead to less injury rate when compared to group B result this is accordance with, two studies reported significant reductions in ankle sprains used balance training programs that had both preseason and in-season components and were performed in a team setting as part of the regular training or practice session, thus were supervised by a coach or athletic trainer. These two studies also reported better subject compliance (≥ 90%). The home-based program, which included a short group training component, was dependent upon subjects performing the majority of the balance training exercises on their own. The findings of this study demonstrated lower subject compliance (60.3%) with subjects participating, on average, in 9 training sessions (range 0–43). Emery et al also demonstrated a significant protective effect of this home-based wobble board training program, while controlling for cluster randomized design, in healthy adolescents where individual training was provided biweekly by a physiotherapist and reported compliance was greater (median 3 times per week; range 1–7). [13]

Result did not show any statistical significance in comparison of interpretation of Lyshlom knee rating score for injury rate in both the groups.

In group A out of 50 subject one subject undergone injury but in group B out of 50 subjects 4 undergone injuries. This statistical insignificance can be due to awareness to prevent injury, and both the groups would have got proper training period for the performance. Result shows a significant difference in comparison of Lyshlom knee score in both the groups group A mean of 84.02 and in group B mean of 79.54 which was statistically significant ($p<0.006$) this is accordance with the studies showed that prior studies has been able to document that a proprioceptive training program will significantly reduce the incidence of ankle sprains in athletes without a prior sprain. Verhagen et al, who found that the average time lost from volleyball after an ankle sprain was not affected by taking part in a balance training program. [19, 20, 21, 24]

This same reason would have influenced for knee by increasing the lyshlom knee score.

Hence there is a significant effect of five phase balance training program on risk of knee injuries. But there is no significant association between injury rates and base line characteristics in adolescent athletes.

Limitations

- Training could have influence the study.
- Gender could have influence the study.

Future Implications

 Study can be conducted by taking dominance of leg.
 Study can be conduct to determine whether this exercise program can significantly improve the balance.
 Study can be conducted on level of training program.

Conclusion

The five phase balance training program on knee injuries and outcome of lyshlom knee score in athletes effective. There was a significant difference between the groups for lyshlom knee score after intervention. But there was no significant difference between the groups for all other baseline characteristics. The study concluded that there is a significant effect of five phase balance training program on risk of knee injuries. But there is no significant association between injury rates and base line characteristics in adolescent athletes.

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EFFECTS OF EYE MOVEMENTS ON BALANCE IN CHILDREN
EFFECTUL MIŞCĂRILOR OCULARE ASUPRA ECHILIBRULUI LA COPII

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Key words: children, balance, eye movement

Cuvinte cheie: copii, echilibru, mişcări oculare

Abstract

Introduction: Balance is the state of human body to maintain equilibrium with respect to environment. Children learn to maintain equilibrium as age progresses. There are many factors that contribute in balance. Out of many factors vision and eye movement is one of the factors.

Aim. The purpose of this study was to determine whether the balance is affected by various types of eye movements. The study examined the effects of eye movements on balance in normal children.

Method: Participants were assessed for dynamic balance with respect to different tasks related to eye movements. The data was analysed for type of eye movement, gender and age.

Results: During dynamic balance the duration was more (10.44 sec) during static fixation than saccadic eye movements (7.42sec) and smooth pursuit eye movements (6.12sec). In static fixation, while comparing dynamic balance between both the genders, balance component was more in girls (11.7sec) than boys (9.4sec). In comparison of dynamic balance in the age groups, children between 9 years could balance effectively (13sec) than other age group.

Conclusion: Eye movements can determine the efficacy of visual postural control.

Rezumat

Introducere: Echilibrul este o stare a corpului uman în relaţie cu mediul înconjurător. Copiii învaţă să îşi menţină echilibrul pe măsură ce înaintează în vârstă. Sunt mulţi factori care contribuie la menţinerea echilibrului. Alături de mulţi factori, ochii şi mişcările oculare au un rol important.

Scop. Scopul acestui studiu este de a determina dacă echilibrul este influenţat de diverse mişcări oculare. Studiul a examinat efectul mişcărilor oculare asupra echilibrului la copii.

Metodă: Participanţilor li s-a evaluat echilibrul dinamic în relaţie cu diferite sarcini referitore la mişcările oculare. Datele s-au analizat din punctul de vedere al tipurilor de mişcări oculare, gen şi vârstă.

Rezultate: Durata echilibrului dinamic a fost mai mare (10.44 sec) la fixarea oculară statică decât la mişcarea sacadică a ochilor (7.42 sec) şi la urmărirea cu privirea (6.12sec). La fixarea statică, la compararea rezultatelor echilibrului dinamic între băieţi şi fete, acesta a fost mai bun la fete (11.7 sec) decât la băieţi (9.4 sec). La compararea echilibrului dinamic în funcţie de vârstă, copiii de 9 ani au avut un echilibru mai bun (13sec) comparativ cu alte grupe de vârstă.

Concluzii: Mişcările oculare pot determina eficienţa controlului vizual postural.

Introduction

As it is rightly said by Albert Einstein that "Life is like riding a bicycle in order to keep your balance, you must keep moving." Balance can be defined as "a state of bodily equilibrium". It is the condition in which all the forces acting on the body are balanced such that the centre of mass (COM) is within the stability limits, the boundaries of the base of support (BOS). [1] Good balance helps the child to know how he/she fits into space, stay still when sitting, standing & lying and develop eye movement and vision. [2]

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There are two types of balance i.e. static balance and dynamic balance. Static balance is the ability to maintain the postural stability and orientation with the COM over the BOS and the body at rest. [1] Dynamic balance is the ability to maintain postural stability and orientation with the COM over the BOS while parts of the body are in motion. [2] The body, unless it is fully supported and relaxed, is in constant state of adjustment to maintain its posture and its equilibrium. The forces tending to upset this balance may vary in strength also the body's reactions to maintain its equilibrium will vary in degree. [3]

Vision has a primary role in governing spatial orientation and balance. A vast amount of evidences show that equilibrium responses are highly dependent on vision in adults. [4] As a person shifts position, the object appears to move in the direction opposite to the head movement.

The thalamus and basal ganglia perceive this object motion as resulting from self- motion. It executes appropriate postural adjustments. For object to be perceived accurately, the eye first must have viewed the object as stationary.

Individuals have three visuomotor options given a stationary surrounding. 1) Static fixation is when the target object is kept stationary at a particular place. 2) Saccadic eye movements are fast, voluntary eye movements from a fixation point to another. They are used to scan a stationary environment or to read. 3) Smooth pursuit eye movements allow the eyes to closely follow a moving object. Smooth pursuit is mostly asymmetric and most humans tend to be better at horizontal than vertical smooth pursuit. [5]

Movement perception differs depending on the type of eye movement. During both saccades and visual fixations, the visual surround appears to be fixed absolutely despite eye movement. [6] During SPEMs, however, the eyes register the perceived movement of the visual field caused by the movement of the eyes. [7] The image of the moving object remains stationary on the fovea, whereas the static background, the peripheral visual field, appears to move.

A wobble board is a device used for recreation, balance training, athletic training and brain development therapy. Thus this board stimulates and exercises the parts of the body and brain and also creates the sense of balance. Edwards [8] reported that postural sway was increased when subjects visually tracked a swinging pendulum as compared with when they fixated, but did not examine the effects of saccadic eye movement. Iwase et al [9] and Uchida et al [4] demonstrated that saccades reduced static postural sway when compared with visual fixations and passive eye rotation. Because saccadic eye movements and visual fixations preserve the stable image of the environment, we hypothesized that they would promote postural stability during standing.

Matherial and Methods

50 children were selected for the study purpose. The procedure to be carried out for the study was explained to the parents and the consent was taken for the same. Thereafter the procedure was explained to participants. Shoulder width, or the distance between the acromion processes, was measured by measuring tape and the distance was marked on the testing platform.

Then the participants were instructed to place their feet over the marks and to keep the platform evenly balanced. They then balanced the platform for 45 seconds once to get orientation. After that the testing procedure was explained. Participants were instructed not to move their heads and not to anticipate the movement of the object.

To practice the eye movements, participants stood still on the platform and received verbal feedback about both eye and head movements. The instructions were given as 1) To focus at a fixed target. 2) To focus at alternating fixed target. 3) To focus at the moving target.

A total of nine experimental trials recording were made. Each trial was of 45 seconds duration. If the participants moved their heads, they were reminded to keep still. Occasionally, the participants' eyes would make a saccadic movement away from the stimulus. If more than three of these deviations occurred, the trial was excluded from data analysis. After all the trials were completed, the participants indicated which condition they found most difficult to perform.

At the end all the data was collected, tabulated for statistical analysis

Result

During dynamic balance the duration for which the children balanced while static fixation was 10.44sec., saccadic eye movements was 7.42sec. and smooth pursuit eye movements was 6.12sec. In static fixation, while comparing dynamic balance between both the gender, the girls balanced for 11.7sec. and the boys for 9.4sec.In static fixation, while comparing dynamic balance in the age groups, children with 5 years balanced for 7.5sec., 6 years for 7.4sec., 7 years for 6.7sec., 8 years for 12sec., 9 years for 13sec. and 10 years for 11.4sec.

TABLE NO. 1: COMPARISON OF VARIOUS EYE MOVEMENTS DURING DYNAMIC BALANCE

Sr.no	Eye Movements	Mean (Time in sec.)
1	Static Fixation	10.44
2	Saccadic Eye Movements	7.42
3	Smooth Pursuit Eye Movements	6.12

TABLE NO. 2: COMPARISON OF DYNAMIC BALANCE DURING STATIC FIXATION BETWEEN GIRLS AND BOYS

Sr. no	Gender	Mean (Time in sec.)
1	Boys	9.4
2	Girls	11.7

TABLE NO. 3: AGE WISE COMPARISON OF DYNAMIC BALANCE DURING STATIC FIXATION

Sr. no	Age Group (yrs)	Mean (Time in sec.)
1	5	7.5
2	6	7.4
3	7	6.7
4	8	12
5	9	13
6	10	11.4

Discussion

The data analysis interprets that there is a difference in the duration of dynamic balance during various eye movements. The effect of static fixation on dynamic equilibrium strengthens the dynamic equilibrium control.

An explanation for the strong relationship between eye movements and balance is that the visual control of balance depends on visual perception of a still object. [10] When compared the dynamic balance during static fixation between both genders, the girls showed greater postural stability than boys. As the females have wider pelvis so the base of support is large and hence the balance is maintained.

When studied the age wise comparison of dynamic balance during static fixation children less than 8 years of age displayed significantly greater sway than the older children. For maintaining proper balance, the body's center of mass should be within the base of support. The center of mass when standing is gradually and progressively rising as humans grow older. Therefore, as the age increases the postural stability is maintained. [11]

Conclusion

The results of this study concluded that eye movements can determine the efficacy of visual postural control. Static fixation has a positive effect on balance i.e. it improves the postural

stability thereby supporting the alternate hypothesis. When the postural stability was challenged, the boys showed greater postural sway than the girls and from the study we can also conclude that as the age increases above 8 years the postural stability goes on improving.

Limitations

The study was conducted in the small group.

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WORK RELATED MUSCULOSKELETAL DISORDERS AMONG NIGERIAN MEDICAL LABORATORY SCIENTISTS

AFECȚIUNI MUSCULOSCHELETALE SPECIFICE LOCULUI DE MUNCĂ LA CERCETĂTORII MEDICALI LABORANȚI NIGERIENI

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Key words: prevalence, work, musculoskeletal disorders, medical laboratory scientists

Cuvinte cheie: prevalență, muncă, afecțiuni musculoscheletale, cercetători medicali laboranți

Abstract

Introduction: Work-related musculoskeletal disorders (WRMDs) have been widely identified as a major problem affecting the work force. However, data on WRMDs in medical laboratory scientists in Nigeria are sparse.

Aims: This study aimed to investigate the prevalence of WRMDs, its associated job risk factors, impact and the coping strategies among medical laboratory scientists in Lagos state, Nigeria.

Method: Cross-sectional survey involving 282 respondents who completed a 32-item self-administered questionnaire modified from the Standardized Nordic Questionnaire. Descriptive statistics of mean, standard deviation and percentage and inferential statistics of Chi-square was utilized for data analysis. The level of significance was set at $p<0.05$.

Result: The 12-month and point prevalence rate of WRMDs in the respondents were 67.4% and 29.8% respectively. The low back (35.8%), neck (29.1%), and knees (19.1%) were the most affected body regions. Repetitive job performance was the most perceived job risk factor. Avoidance of lifting heavy objects the most reported coping strategy. Work performance was affected in 15.2% of respondents while 11% had absented from work due to WRMDs. There was significant association in the ages of respondents and 12-month prevalence (X^2=62.828; p= 0.007), years of experience and number of body parts affected (X^2=216.209; p< 0.001)

Conclusion: There is a high prevalence of WRMDs among medical laboratory scientists in Lagos state with the low back and neck being the most commonly affected. There should be increased awareness of preventive measures and proper ergonomic postures in work places of medical laboratory scientists.

Rezumat

Introducere: Afecțiunule musculoscheletale specifice locului de muncă (WRMDs) sunt considerate o problemă majoră care afectează forța de muncă. Date conctere privind WRMDs la cercetătorii medicali laboranți din Nigeria sunt puține.

Scop: Acest studiu își propune să analizeze prevalența WRMDs și riscurile asociate, impactul și strategiile de gestionare a acestora, în rândul cercetătorilor medicali laboranți din statul Lagos, Nigeria.

Method: Un chestionar încrucișat s-a aplicat la 282 respondenți, care au complectat un chestionar modificat autoadministrat de 32 de itemi, din Standardized Nordic Questionnaire. S-a realizat analiza statistică descriptivă precum media, abaterea standard și procentajul. Pentru statistica inferențială s-a folosit Chi-square. Nivelul de semnificație s-a stabilit la $p<0.05$.

Rezultate: S-a constatat o prevalență a WRMDs la respondenți de 67.4% și respectiv 29.8%. Regiunea lombară, (35.8%), zona cervicală (29.1%), și genunchii (19.1%) au fost cele mia afectate segmente ale corpului. Acțiunile repetitive au fost percepute ca fiind cel mai mare factor de risc. Evitarea ridicării obiectelor grele a fost cea mai raportată trategie de gestionare. Performanța la locul de muncă a fost afectată la 15.2% dintre respondenți iar 11% au absentat de la muncă datorită WRMDs. Există o asociere semnificativă între vârsta respondenților și prevalența la 12 luni (X^2=62.828; p= 0.007), anii de experiență și numărul părților corpului afectate (X^2=216.209; p< 0.001)

Concluzii: Există o mare prevalență a WRMDs la cercetătorii medicali laboranți din statul Lagos, coloana lombară, cevicală și genunchii fiind cele mai afectate zone. Este necesară accentuarea importanței măsurilor preventive și a posturilor ergonomice la locul de muncă, la cercetătorii medicali laboranți.

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Introduction

Work-related musculoskeletal disorders (WRMDs) are conditions of the musculoskeletal system which have been proven or assumed to have at least a work-related background [1]. They have been described as one of the most common cause of long-term pain and physical disability that affects hundreds of millions of the working-class people across the world [2], resulting in high costs of worker's compensation [3]. The United States department of labour in 1994 stated that Work-related upper extremity musculoskeletal disorders accounted for more than 60% of all newly reported occupation related illnesses [4].

In recent years, investigations of WRMDs has attracted considerable attention because of its importance in the assessment of ergonomic risk factors involved in industrial work places [4]. Increasing evidence also suggests that musculoskeletal disorders are common in workers in the health care industry [5]. Physiotherapists, who commonly treat patients with these disorders, have been found to be at risk of WRMDs in the upper limb and low back [2,6,7,8]. Tinubu et al, [9] established that WRMDs are common among Nurses in Ibadan, South west, Nigeria. Tella et al [10] in a similar study on bank workers showed that neck and upper extremity repetitive stress injury is prevalent among bank workers, which may be associated with the type of job, work station design and job demand. High prevalence of low back pain has also been observed among those in the farming occupation because of awkward postures assumed while performing their farm tasks [11]. In a related study, Aweto et al [12], reported that low back pain was the most common area of discomfort, followed by the shoulder and then the neck among hairdressers.

Medical laboratory scientists, in addition to the risk involved with the use of hazardous substances, are constantly exposed to many ergonomic risk factors due to the nature of their work [13,14]. These ergonomic risk factors include their sitting posture, fixed or constrained body position, continual repetition of movement, excessive force concentrated on small parts of the body, such as the hand or wrist, a pace of work that does not allow sufficient recovery or rest between movements or tasks, standing for long periods of time, contact stress i.e. resting the forearms or wrists on the hard edge surface, pinch grip [15].

Agwaral et al [14] in a review of WRMDs among medical laboratory professionals showed overall prevalence's ranges of 40-60%, with neck being more prevalent at 18-78%. Several studies have reported high prevalence of musculoskeletal disorders among different occupational groups in Nigeria. [2,5,6,8,9,10,11,17], there is however dearth of information on the prevalence of musculoskeletal disorders among medical laboratory scientists, especially in developing countries, which includes Nigeria. This is pertinent due to lack of appropriate facilities and adequate information which are predominant in such environment.

Purpose

This study was therefore designed to evaluate the prevalence of work-related musculoskeletal disorders among medical laboratory scientists, the most commonly affected body parts, the risk factors of the WRMDs and the coping strategies adopted by the medical laboratory scientists in Lagos state, Nigeria.

Material and Methods

Subject

Respondents in the study were registered medical laboratory scientists who had at least one-year post qualification experience and were practicing in hospital based or private medical laboratories in Lagos state. The respondents were neither interns nor on industrial attachment at the time of the study.

Assessment

The questionnaire for this study was modified from questionnaires of previously published surveys. Its content validity was evaluated by a group of seasoned physiotherapists during a focus group session. It consisted of 32 items and seven sections. Section A sought information on the bio-data of the respondents. Section B included information on their work experience. Section C was on postures assumed at work. Section D was on information about symptoms of musculoskeletal injury. This section was a modification of the standardized Nordic questionnaire and it included a picture showing ten areas of the body that are vulnerable to work related injuries. The respondents were asked to tick the area of their injury. The respondents were also requested to indicate the most significant WRMD injury experienced and time of the first experience of the WRMD. Section E collected information on the effect of musculoskeletal disorder on job performance. Sections F and G sought information on the probable causes or risk factors of musculoskeletal disorder and coping strategies adopted in reducing the effect of the musculoskeletal strain on the body.

Three hundred and fifty-four copies of the questionnaire and informed consent forms were distributed individually to the medical laboratory scientists at their places of work. Copies of the questionnaire were completed and returned immediately.

Data Analysis/Means

Data was summarized using descriptive statistics of mean, standard deviation and percentage. Chi-square analysis was used to determine the association of prevalence of WRMDs with specialty area, years of experience, age, gender, duration of working hours and posture. The data was analysed using SPSS version 13 with the alpha level set at $p \leq 0.05$.

Result

Three hundred and fifty-four copies of the questionnaire were distributed but only 287 copies were returned giving a response rate of 81.1%. Five of the copies were invalid for analysis due to non-response or incomplete response in most parts of the questionnaire. Therefore, 282 copies of the questionnaire were analysed in this study. No reasons were given for non-response by those who did not return their copies of the questionnaire.

Socio-demographic characteristics of the respondents

One hundred and forty-nine (52.8%) male and 153 (47.2%) female laboratory technologists participated in the study. The age of the respondents ranged from 21 years to 64 years with a mean of 37.94 ± 8.50 years. Two hundred and seventy-seven respondents (98.2%) reported having a qualification in Medical Laboratory Science. Bachelor degree, Masters, fellowship and postgraduate diploma, were the highest educational attainment in 135(47.9%), 53(18.8%), 46(16.3%) and 29 (10.3%) of the respondents respectively.

Work experience and activity of respondents

The mean year of work experience of the respondents was 11.4 ±8.22years. Majority of the respondents 150 (53.2%) had between 1-10 years of work experience. Ninety-one (32.3%) respondents worked in a teaching hospital, 78 (22.7%) worked in private laboratories, 55 (19.5%) worked in general hospitals while 52 (18.7%) worked in private hospitals, public laboratories and research institutes. Majority (103, 36.5%) of the respondents specialized in microbiology/parasitology while 25 (8.9%) respondents specialized in histology. Most of the respondents (183, 64.9%) worked on an average of 0-40 specimens per day. Thirty-nine (13.8%) and 23 (8.2%) respondents worked on an average of 41-80 specimens and 81-120 specimens respectively. Two hundred and forty-six (87.2%) of the respondents work for 6-10 hours per day and most of the respondents (250, 88.7%) reported working for an average of 5-6 days per week.

Work postures and sitting platforms

At work, 211 (74.8%) of the respondents adopted a sitting and bending at the neck posture 186 (66%) adopted a standing and bending neck posture, 109 (38.7%) adopted the sitting and bending at the waist posture while 83 (29.4%) adopted the standing and bending at the waist position. Fifty-nine (20.9%) of the respondents stood and bent at the neck for less than 1 hour during work, 39 (13.8%) of the respondents stood and bent at the waist for less than 1 hour, 42 (14.9) of the respondents sat and bent at the neck for 4 hours while 27 (9.6%) of the respondents sat and bent at the waist for less than 1 hour (table 1). At work, 112 (39.7%) of the respondents sat on high backless stools. One hundred and thirty-one of the respondents were comfortable with their sitting platforms at work while 134 were dissatisfied with their sitting platforms at work especially the high backless stool (figure 1).

Table 1: Type and duration of work postures

	Posture Assumed			
	Standing and bending at the neck n(%)	**Standing and bending at the waist n(%)**	**Sitting and bending at the neck n(%)**	**Sitting and bending at the waist n(%)**
Not applicable	96(34)	199(70.6)	71(25.2)	173(61.3)
<1 hour	59(20.9)	39(13.8)	28(9.9)	27(9.6)
1 hour	26(9.2)	14(5)	25(8.9)	26(9.2)
2 hours	36(12.8)	7(2.5)	42(14.9)	10(3.5)
3 hours	26(9.2)	13(4.6)	31(11)	22(7.8)
4 hours	20(7.1)	4(1.4)	42(14.9)	11(7.8)
5 hours	13(4.6)	3(1.1)	27(9.6)	10(3.5)
>5 hours	6(2.1)	3(1.1)	16(5.7)	3(1.1)
Total	282(100)	282(100)	282(100)	282(100)

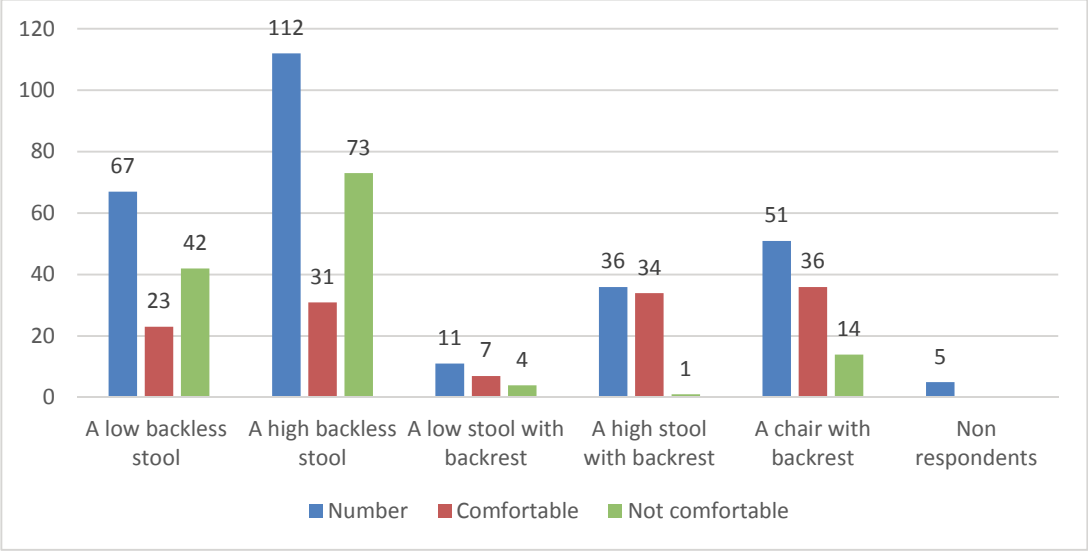

Figure 1: Sitting platform and comfort

Prevalence of WRMD

The prevalence of WRMD in respondents is shown in table 2. The 12-month prevalence of WRMD in the respondents was 67.4% while the point prevalence of WRMD in the respondents was 29.8%. Females had higher 12-month prevalence (34.8%). Respondents between the ages of 31 and 40 years had higher 12-month prevalence (25.2%). The low back was the affected body part with the highest 12-month prevalence (35.8%).

Table 2: Prevalence and Body Part affected

	12-month prevalence		Point prevalence	
Body part	**frequency**	**%**	**Frequency**	**%**
Neck	82	29.1	39	13.8
Shoulders	54	19.1	18	6.4
Upper back	29	10.3	10	3.5
Elbow	2	0.7	2	0.7
Low back	101	35.8	42	14.9
Wrist/hands	18	6.4	5	1.8
Hips/thigh	6	2.1	2	0.7
Knees	26	9.2	8	2.8
Ankles/feet	21	7.4	7	2.5

Treatment of WRMD

One hundred and one (35.8%) of the respondents reported that they sought treatment of which 26 (9.2%) and 35 (12.4%) were treated by physiotherapists and general practitioners respectively while 39 (13.8%) resorted to self-medication. Reasons cited by most of the participants who did not seek treatment include disappearance of symptoms, 20 (7.1%), ability to bear the pain, 14 (5%), taking rest to ease symptoms, 11 (3.9%), no time to seek treatment due to busy schedules, 10 (3.5%), felt unbothered since it occurred occasionally, 7 (2.5%), or work related, 6 (2.1%), procrastination, 2 (0.7%), and performance of exercises or yoga, 2 (0.7%). No reason was given by 11 (3.9%) of respondents

First experience of pain was observed during internship, 38 (13.5%), at the first 5 years after graduating, 69 (24.5%), 5 to 15 years after graduating, 50 (18.1%) and more than 15 years after graduating in 31 (11%) of participants.

Impact, risk factors and coping strategies of WRMD

Forty-three (15.2%) of the respondents reported that the WRMD affected their performance at work and 31 (11%) stated that the WRMD caused them to be absent. Repetitive performance of the same task was the major risk factor, reported by 240 (85.1%) of the respondents. Static positions, high number of procedures, inadequate rests and work schedules were reported in 213 (75.5%), 205 (72.7%), 165 (58.5%) and 142 (50.3%) of respondents respectively. The least reported risk factors are continuous reaching for objects away from the body 74 (26.2%), continuous work despite injury, 42 (14.9%) and heavy lifting, 27 (9.6%). To cope with their disorders or pain, majority 115 (40.8%) of the respondents avoided lifting heavy objects. One hundred and ninety (67.3%) respondents modified their positions continuously, 166 (58.9%), had to pause between procedures, 163 (57.8%) usually selected non-aggravating techniques and procedures while 89 (31.6%) and 66 (23.4%) usually alter their schedules and use analgesic drugs respectively. Sixty three respondents (22.4%) always sought medical advice, 18 (6.4%) respondents sought physiotherapy advice while 14 (5%) used alternative medicine.

Association of variables

The association of Specialty area, years of experience, age, gender, duration of working hours, work postures with prevalence of WRMDS among medical laboratory scientists are

presented in table 6. There was an association (p= 0.01) between the ages of the respondents and the 12-month prevalence of WRMDs. An association (p< 0.001) was also observed between the years of experience and the number of body parts affected.

Table 3: Chi-square association between Specialty, Years of Experience, Age, Gender, Working Hours, Working Postures and Prevalence of WRMDS

	Frequency (%)	Prevalence (%)	X^2	P-value
Specialty				
Haematology	81 (28.7)	53 (27.9)		
Microbiology/parasitology	103 (36.5)	66 (34.7)	7.03	0.07
Histology	25 (8.9)	23 (12.1)		
Chemical Pathology	73 (25.9)	48 (25.3)		
Years of Experience				
1-10	150 (53.2)	88 (46.8)		
11-20	85 (30.1)	72 (38.3)	38.28	0.14
21-30	36 (12.8)	22 (11.7)		
31-40	8 (2.8)	6 (3.2)		
No response	3 (1.1)			
Ages				
21-30	69 (24.5)	41(14.5)		
31-40	112 (39.7)	71(5.2)	62.83	0.01*
41-50	79 (28)	63(22.3)		
51-60	21(7.4)	14(5.0)		
>60	1(0.4)	1(0.4)		
Gender				
Male	149(52.8)	92(32.6)	3.74	0.05*
Female	153 (47.2)	98(34.8)		
Length of work hours				
1-5	7 (2.5)	12 (6.3)		
6-10	246 (87.2)	159 (84.1)	10.94	0.62
11-15	25 (8.9)	16 (8.5)		
16-20	2 (0.7)	2 (1.1)		
No Response	2 (0.7)			
Work Posture				
Standing and bending at the neck	79 (28)	77 (29.1)	2.01	0.16
Standing and bending at the waist	37 (13)	29 (10.9)	3.27	0.07
Sitting and bending at the neck	127 (45)	120 (45.3)	1.34	0.25
Sitting and bending at the waist	39 (14)	39 (14.7)	2.54	0.28

Discussion

This study was carried out to evaluate the prevalence of WRMDs among medical laboratory scientists in Lagos state. To the best of the knowledge of the authors no study has investigated the work related musculoskeletal disorders among medical laboratory scientists in Nigeria. Studies have investigated the WRMDS among health professionals (2,5,7,8) and awareness of ergonomics among medical laboratory scientists [18] but research has not focused on the peculiar work related disorders among medical laboratory scientists in this environment.

In this cross-sectional survey, a 12-month prevalence rate of 67.4% was observed. This suggests that WRMDs are a substantial problem among medical laboratory scientists in Lagos state. However, this prevalence is slightly higher than the previously reported in literature. Agwari et al [13] observed a prevalence rate of 21.2%, Agwari et al [14] in a review also observed a prevalence rate of 40%-60%. This may be due to the low knowledge and application of ergonomic principles by medical laboratory scientists [18] and the work settings obtainable

in the Nigerian environment. Majority of the respondents reported a gradual onset which is typical of WRMDs.

The highest incidence of pain occurred in respondents that work in teaching hospitals. This may be due to the high work demand associated with these hospitals. There was also a high incidence of WRMDs among those respondents who specialized in microbiology and parasitology. This may be due to their frequent static posture (i.e. sitting and bending at the neck) when they use the microscope. It was also noticed that they used more of the high backless stool which could also be a contributing factor to the occurrence of WRMDs.

This study revealed a significant association between age and prevalence of WRMDs among medical laboratory scientists. The highest incidence of WRMDs occurred in respondents within the age group of 31-40 years. This may suggest that medical laboratory scientists in this age group are more prone and are commonly affected by WRMSDs. This might be due to the relatively higher level of work activity performed by medical laboratory scientists in this age group. This agrees with the study of Guo et al [22], who reported that the prevalence of musculoskeletal disorders increases as people enter their working years and by age 35, most people have had their first episode of WRMDs.

A high incidence of WRMDs occurred in respondents with working experience of between 1-10 years and decreasing as the years of experience increases though inferential statistics showed no significant association between years of experience and prevalence of WRMDs. This suggests that most medical laboratory scientists usually have WRMDs in their first 10 years of practice. This agrees with the study by Friedrich et al, [23], which showed that there is no significant effect of years working experience on WRMDs. But as the years of experience increase, the respondents tend to be affected in multiple areas.

The low back and the neck were the most frequent area of pain and discomfort because of work irrespective of their specialty, thereby corroborating previous findings by Friedrich et al, [23] and Maul et al, [24] who reported that the lower back and neck were the most frequently affected body part by WRMDs. This could be due to their ergonomically unsuitable sitting positions, work platforms, frequent use of the microscope and computers.

There was a very high incidence of WRMDs among those who use high backless stools with the lowest incidence occurring among those using the low stools with backrests. Also, there was a high incidence of WRMDs occurring in those respondents who reported being uncomfortable with their sitting platform at work with majority of them using high backless stools. This may imply that their sitting platforms could be a cause for their low back pain as majority of those respondents using high backless stools reported pain in the low back.

Repetitive tasks, performing lots of procedures, insufficient breaks, over exertion and static positions were the most cited risk factors for WRMDs by the respondents. This suggests that tasks performed by the medical laboratory scientists have a significant effect on the occurrence of WRMDs.

The respondents in this study adopted varying coping techniques ranging from rest to drugs. But scantily few sought medical advice concerning their condition giving reasons like “no need”, “the pain disappeared after rest”, “no time” etc. Even fewer sought physiotherapy advice concerning their condition possibly because of the lack of knowledge of the role of physiotherapy in the management of various WRMDs. This showed the level of awareness of medical laboratory scientists on the proper steps to take in the alleviation of pain and discomfort arising from WRMDs. This also indicates the need for enlightenment about proper management of WRMDs among Medical Laboratory Scientists.

Conclusion

There is a high prevalence of WRMDs among medical laboratory scientists in Lagos state with the low back and neck most commonly affected irrespective of specialty of medical laboratory scientists. There is little or no awareness about physiotherapy and their role in management of WRMDs. Age of the medical laboratory scientist is a predisposing factor to WRMDs. The number of body parts affected is associated with the number of years of experience. There should be increased public awareness on the prevalence of musculoskeletal disorders among Medical Laboratory Scientists and an increased awareness of preventive measures and proper ergonomic postures in their work places.

Key points to note from this study are that medical laboratory scientists in Lagos state, Nigeria are at risk of WRMDs due to the work environment and peculiar tasks, the low back is the most frequently injured part of the body in respect of WRMDs and advocacy on preventive measures is required to reduce occurrence of WRMDs among medical laboratory scientists.

Limitations

Self- reported responses were utilized in this study for data. This might be a limitation as recall inaccuracies may occur.

Acknowledgement

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