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Absolute platelet count in adult patients with musculoskeletal pain: Current perspectives

Ezimah, Anthony C.U[1].,Obeagu, Emmanuel Ifeanyi[2*], Asur, Arhyel[3], Ezimah,Uloaku A[4]. and Ezimah,Chinyereugo O[4].

[1]Department of Physiology, Faculty Basic Medical Sciences, Federal University Ndufu-Alike Ikwo, PMB 1010, Abakaliki. Ebonyi State Nigeria
[2]Diagnostic Laboratory Unit,Health Services Department, Michael Okpara University of Agriculture,Umudike,Abia State, Nigeria.
[3]Department of Medical Laboratory Science,University of Maiduguri, Nigeria.
[4]Departments of Medicine and Pharmacy, Bank Hospital, P O Box 2342, Umuahia. Abia State Nigeria
*Corresponding Author

Abstract

Musculoskeletal pain is a disease of multiple aetiologies. Study on certain haematological profiles help to relate disease state to possible aetiology and enhances diagnosis. The absolute platelet count in blood of patients suffering from musculoskeletal pain and diseases were investigated in this study. Other haematological profiles such as the PCV, WBC and blood film examination were performed to serve as a guide in concluding if changes in platelet level of patients with musculoskeletal pain are accompanied by similar changes in the number or morphology of the red blood cells and white blood cells. 130 patients were investigated for absolute platelet count 70 (58.3%) patients with musculoskeletal pain and 50 (41.7%) were controls. 46 (65.7%) of the test were male and 24 (34.3) were females. Results obtained showed a mean platelet value of 272.09 ± SD for test and a Mean platelet value of 212 2 = SD for control. Pattern of individual results obtained from different patients showed increase in platelet value above normal in patients who had underlying diseases and inflammatory condition. The test mean platelet value was (271.31 ±SD) for males and (273.90 ± SD) for females, indicating a slight difference between that of males and females. Using inferential statistics, results she am ($p>0.05$) difference between the mean platelet values of test (272.09 ± SD) and control (222.2 ± SD). Other haematological profiles studied were PCV which presented a mean value of 0.3949 for test and 0.4131 for control subjects, indicating no significant difference in value. Mean value for total WBC was 6.023 and lies within the normal range. It was concluded that theses haematological parameters were not affected much in patients with musculoskeletal pain with the exception of those associated with chronic conditions.

Keywords: Musculoskeletal pain, multiple aetiologies, haematological profiles, PCV.

Introduction

Musculoskeletal pain is the result if damage to the muscles, ligament, tendons along with the bone (Charlotte and Grayson, 2004). Musculoskeletal pain is caused by various factors which include wear and tear of daily activities, trauma to an area (such as jerking movements, dislocations,

fractures, sprains, auto accidents, falls and direct blows to the muscle (Charlotte and Grayson, 2004). Other causes include postural straining, repetitive movements, overuse and prolonged mobilization. Changes in posture or poor body mechanisms might bring about spinal alignment problems and muscle shortening, therefore causing other muscles to be misused and become painful (Ephraim., 2007).

Often, the body's response to injury is too tense on the injured area, which restricts blood flow Increased pain can in turn cause increased tension, resulting in a pain-tension cycle that might be hard to overcome. Poor body mechanisms and posture, along with stress can cause increased muscle tensions which then contributes to the pain. Inactivity as a result of pain gradually leads to musculoskeletal weakness and de-conditioning contributing to the pain (Charlotte and Grayson, 2004).

The pattern of laboratory requests in the haematology department of the University of Maiduguri Teaching Hospital and other hospital records suggests that the number of patients with musculoskeletal pain is increasing. Musculoskeletal pertains to the muscular and skeletal systems. The muscles and the skeleton - the bony framework of the body, supporting and protecting the soft tissues and organs, and acting as attachments for muscles, could be subjected to numerous insults and injury by environmental, infection, pathological, metabolic and several other factors.

In the contemporary society, musculoskeletal pain is responsible for loss of significant man-hours and decreased productivity as affected individuals withdraw from circular work, sports and other productive activities.

In the local community, there is the problem of drug abuse. It is suspected that many patients who have musculoskeletal pain indulge in self-medication. Only a minor percentage is believed to patronise tertiary health institutions. It is therefore imperative that those patients with musculoskeletal pain who visit tertiary health establishments should have their disorders investigated in a comprehensive manner.

Musculoskeletal pains that affect adults have different aetiologies therefore making diagnosis more demanding and sometimes difficult. It presents with different symptoms and often begins with body aches, joint pains, the muscles might feel like they have been pulled or overworked. Most times muscles twitch or bum. Major symptoms that are common include: pain, fatigue and sleep disturbances.

Platelets are elements within the bloodstream that recognize and cling to damaged areas inside the blood vessels. When they do this, they trigger a series of chemical changes that result in the formation of a blood clot (Liesner et al., 1997). Platelets are produced in most conditions of musculoskeletal pain, therefore a need to perform a study on the level of increase in different classes of the disease; this will help in the treatment and management of the patient.

Weakening of bone, muscles and joints due to musculoskeletal pain exposes the patient to risk of fatal falls and dislocations, severe injury inflicted on affected area triggers platelet aggregation due to bruises (Suzanne, 2009). Different causes of musculoskeletal pain could reflect in unique patterns of platelet count. Ascertaining the pattern of platelet count in the patients at this time is worthwhile. I am not aware that any study has been done to assess platelet count in adult patients with musculoskeletal pain in the University of Maiduguri Teaching Hospital, therefore this study is worthwhile.

Research questions

Musculoskeletal pain is pain which arises from and affects the muscle and skeletal system. The condition is classified based on the region of pain in the body. Pain experienced can be traced to stress, trauma, infection, muscle straining and fractures with very few cases been inherited as musculoskeletal disease e g. rheumatoid disease . It is obvious that the condition affects many parts of the body and the following questions would arise in this investigation regarding this ailment. The salient questions are:

What is the frequency of patients with musculoskeletal pain in the study centre?

What are the associated clinical conditions?
What is the level of platelet count in each of the patients?
Does the platelet count point to outcome (prognosis) and disease progression?

Objectives of the study

The objective of this study is to count, confirm and characterize based on normal or altered morphology the absolute platelet count in patients with musculoskeletal pain attending the University of faiduguri Teaching Hospital. The objectives are outlined as follows:

To perform an absolute platelet count on blood of patients with musculoskeletal pain compared to controls.
To evaluate platelet morphological picture in patients with musculoskeletal pain in a way to relate cell morphology to disease state and possible aetiology.

Materials and Methods

Subjects

The subjects in this study were recruited consecutively. All subjects coming to the university of Maiduguri teaching hospital and referred to the haematology department were recruited for the study. The second groups are those with a confirmed recurrent musculoskeletal disease that are not on therapy. A total of 200 Patients were recruited. They were separated into two distinct groups of 150 patients with musculoskeletal pain and 50 apparently healthy subjects who served as -Controls. The study was conducted between April 2009 and January 2010.
Various information obtained from patients includes name, age sex, address and complete clinical detail.

Exclusion criteria

All patients already on any form of therapy were excluded from the study. Patients who fail to give necessary details due to a communication barrier or ignorance and patients whose request forms do not carry necessary clinical details.

Study site

The study area is the university of Maiduguri teaching hospital. N

Methodology

Specimen collection

Blood samples were routinely collected from qualified patients. Completely sterile syringe and needles were used in each case. Patients who were qualified were bleed immediately. A tourniquet was tied to the upper arm. The area for phlebotomy was cleansed with 70%alcohol. The needle was inserted into the vein and 5mls of blood was withdrawn. Blood was dispensed into a bottle containing EDTA (ethylenediamine terra-acetic acid) anticoagulant. The bottle was labeled with patient identity including name and hospital number. The blood was properly mixed by gently inverting the container up and down for about 4-8 times.

Absolute platelet count

This is the standard method for assessing the number of platelets in a blood sample. Test is run immediately after blood collection. Confirmation is done by examining a blood film for platelet population and morphological appearance.

Principle

Whole blood is diluted 1 in 20 in a filtered solution of 1% ammonium oxalate (10g/l). The reagent lyses all other blood cells and leaves the platelet intact. Using an improved neubauer counting chamber, the numbers of platelets available were counted in five boxes within the ruled area of the neubauer counting chamber.

Specimen

Freshly collected EDTA anticoagulated blood was used for the test. Capillary blood is exempted because platelets clump easily as blood is collected and this will affect the count.

Reagent

1% ammonium oxalate was used (1% w/v or 10g/l). The reagent was filtered before each use.

Fresh reagent was made after every 4 days and refrigerated at 4°C.

Materials/Equipments

Improved neubauer counting chamber, cover glass, Pasteur pipette, automatic pipette, cotton wool, Petri dish, light microscope, test tubes, test tube racks, hand counting machine

Method

0.38ml (380ul) of filtered ammonium oxalate solution was dispensed into a clean test tube.
0.02ml (20ul) of freshly collected well mixed EDTA anticoagulated blood was dispensed in the ammonium oxalate solution.
The counting chamber was cleaned properly and assembled.
The cover glass was carefully slid into position and the grid area of the chamber was filled with the diluted blood sample.
The chamber was left undisturbed for wool in a Perri dish.
The underside of the chamber was microscope stageon a dampened cotton and placed on the.
Using the 10x objective, the rulings for the chamber was focused and the central square of the chamber was brought into view.
The objective was changed and the platelets were focused.
Platelets were counted in 5 large squares of the ruled counting area.
The number of platelets in 1 litre of blood was reported. This was the actual number of cells counted x 109.

Blood film examination

Reagent

Leishmann's stain was used for fixing and staining the blood film. 0.15g of leishmann's powder was dispensed in 100mls of methanol and mixed properly till Leishmann's powder dissolves. Reagent was covered and stored at room temperature. Stain is stable for weeks. Leishmann's stain was filtered before storing at room temperature.

Making and staining blood film

A drop of blood was placed at one end of the clean glass slide.
A spreader was placed on the glass slide and was drawn back to touch the blood.
The blood was allowed to extend along the edges of the spreader.
Holding the spreader at angle of 45°, the blood was spread to make a thin film.
The thin film was allowed to dry for 5 minutes.
The film was flooded with Leishmann's stain and aloud to fix and stain for 2 minutes.
The film was flooded with buffered water (p.H 6.8) and was allowed to act for 8 minutes.
The film was washed with water and the underside of the glass slide was cleaned with cotton wool.
The slide was placed on a slide rack to air dry

Blood film examination for platelets

Blood film examination provides information about platelet morphology and easy assessment of platelet population on the blood picture. A well stained blood film can be used to confirm the genuinely and precision of an absolute platelet

Procedure

A drop of immersion oil was placed cm the stained blood film. The blood film was placed on the stage of the light microscope.
Using the 40x objective, the cells of the blood film were brought into view and examined.
The lens was switched to l00x objective, the blood cells were brought into view and platelets were carefully assessed. The morphology and population was carefully taken note-of and was compared to the absolute platelet count.

Other haematological investigations

Other haernatological tests were done including the packed cell volume test (PCV), total white blood cell (WBC) count and the differential white blood cell counts. Statistical analysis and data presentation

Data generated from the study were analysed using me student t-test statistical method (Dean et al.. 1995. Data analysis will be done using Chatfield statistical model .

Results

A total of 120 patients constituted the study population, 70 (58.3%) patients with musculoskeletal pain and 50 (41.7%) absolutely healthy patients as controls.

Table 1: Features of the study population

		PATENTS WITH MSP		CONTROLS	
1 (Yrs)					
		M	F	M	F
18-27	27	9	5	18	5
28 -37		11	9	12	3
38-47	- 47	15	7	8	2
48-57	57	8	1	2	0
58-67	67	3	0	0	0
68-77		0	I	0	0
TOTAL		46	24	40	10
GRAND TOTAL			70		50
Mean Age			38.9		30.82

KEY: MSP - Musculoskeletal pain; M - Male; F- Female

Age and gender distribution of patients with musculoskeletal pain in table 4.1 shows that 46 (65.7%) were male and 24 (34.3) were females. Patients with musculoskeletal pain were significantly higher in the decade age range of 28-37 and 38-47 followed by 18-27 and 48-51. More males were infected by this disease than females.

Table 2 age and gender distribution of patients with musculoskeletal pain

AGE GROUP Yrs	PATIENTS M	F	TOTAL n(%)
18-27	9	5	14(20)
28-37	11	9	20(28.6)
38-47	15	7	22(31.4)
48-57	8	1	9(12.8)
58-67	3	0	3(4.3)
68-77	0	2	2(2.9)
Total	46(65.7%)	24(34.3%)	70(100%)
Grand Total (%)	70 (100%)		

The age group and gender distribution of control subjects included 40 (80%) males and 10 (20%) females. Most of the control patients were with the decade age range of (18-27) years 23 (46%) followed by (28-37) years 15 (30%). There were more males than females.

Table 3 Age and gender distribution of control patients

AGE GROUP (Yrs)	CONTROLS M	F	TOTAL n(%)	
18 -27	18		5	23(46)
28-37	12		3	15(30)
38-47	8		2	10(20)
48-57	2		0	2(4)
58-67	0		0	0(0)
68-77	0		0	0(0)
Total	40.(0%)		10(20%)	50(100%)
Grand total	50			

Table 4 Mean platelet and other haematological profile of patients with musculoskeletal pain and control patients

PARAMETERS	PATIENT		CONTROL	
	Mean	SD	Mean	SD
PLATELET	272.09 +	64.403	222.42	+51.922
PCV	0.3949 +	0.03706	0.4131	+ 0.0113
TOTAL COUNT	WBC 6.023 +	2.1428	5.012	+1.921

Mean haematological profile of patients with musculoskeletal patients and control subjects showed that the mean platelet value of test result was 272.09 ± SD compared with the mean platelet value of control patients 222.2 ± SD. The mean for other haematological parameters for test patients were PCV 0.3949 and total WBC 6.0. See Appendix 1 for mean value of neutrophil 64.49, eosinophil 1.69, lymphocyte 32.12, and basophil 0.00.

The highest value of absolute platelet studied for test patients was 530 (X 109) cells/L and the lowest value was 184 (X 109) cells/L. The highest value of absolute platelet studied for control patients was 331 (X 109) cells/L and the lowest value was 121 (X 109) cells/L. The mean and standard deviation for absolute platelet count and other haematological parameters was obtained using the student t-test statistical methods. The mean value for the packed cell volume and white cell count of the test and control are within similar range. It could be inferred from individual results that values obtained were based on severity severity of the disease.

Comparison between absolute platelet count in test result and control reslt

Inferential statistics

ho: There is no significant difference between the mean platelet count values of the patient test result and control result.

Hi: There is significant difference between the mean platelet count values of the test and control.

PARAMETER	TEST	CONTROL
Absolute platelet count	272.+ 64.40	222.0+51.92

TEST : Student't' test
Two tail
P=1.07>0.05
Therefore, Hi is rejected and Ho is accepted.

Discussion

Musculoskeletal pain is a disease of various aetiologies. It manifests as a disorder on its own or secondary to other diseases or chronic disorder. The most important cause primarily ranges from dislocations, fractures, sprains, auto accidents, falls, wear and tear from daily activities and severe burns (Charlotte et al.. 2004). Other primary causes include postural straining, repetitive movements, overuse and prolonged mobilization, Musculoskeletal pain could also be secondary to chronic disorders such as pyelonephritis which will cause pain on the left flank and also due to age which is as a result of weakness to the joints, tendons, ligaments and muscles. The effect of this disease brings about spinal alignment problems, muscular shortening, Poor body mechanisms and posture, along with stress which causes increased muscular tension and causes serious pain in the affected bone or muscle (Ephraim, 2007). This leads to certain changes in haematological parameters which are usually due to damage to blood vessels present in affected tissues, excessive compression of joints and muscular straining (Liesner et al, 1997).

In this study, absolute platelet count of affected patients was the major haematological parameter of concern. Other haematological parameters such as PCV, total WBC count and blood film examination were performed to serve as guide in concluding if changes in platelet level in musculoskeletal pain are accompanied by similar changes in the number or morphology of other haematological parameters.

Platelets are elements within the bloodstream that recognize and cling to damaged areas inside the blood vessels. When they do this, they trigger a series of chemical changes that result in the formation of a blood clot (Liesner et al., 1997). Platelets are produced in most conditions of musculoskeletal pain.

From the result obtained, the mean value for absolute platelet count in pat with musculoskeletal pain (272.09) was higher than that of the control patients (222.0) which comprised mainly blood donors 32 (64%) and apparently healthy subjects 18 (36%). Using student t-test statistical method, the level of significance for absolute platelet count obtained from test and control was p=1.07 which infers that there is no significant difference between the mean platelet value of test and control. A study in Australia on the prevalence of musculoskeletal pain shows that the disease is relatively common among those living in North-western suburbs of Adetaide. Results obtained from the study shows that increase in blood platelet level was more common in patients with arthritis, patients with back pain and general body pain did not manifest with high increase in platelet value (Tiffany et al., 2008). Patients with chronic fatigue syndrome (CFS) experience chronic musculoskeletal pain which is even more debilitating than fatigue and it was show to be associated with mild thrombocytosis (Jo et al.. 2006).

A study on the effect of lower back pain in Nigerian adults revealed that patients with lower back pain had impaired physical activity when compared with apparently healthy individuals, and statistics showed that the difference between their haemostatic profiles was not significant. Patients severe bone diseases, infection and rheumatoid arthritis show slight increase in platelet level compared to other patients.

Morphology of platelets were all normal as examined from a well stained blood film except for three out of seventy (4.3%) with platelet aggregation and out of seventy (4.3%) with few giant platelets. Definite conclusion as to the aetiology of the disease was not possible because all the patients did not present any other disease or complication.

The packed cell volume was reduced below normal in both males and females that were affected and the combined mean shows that patients affected with musculoskeletal pain suffered from a slight decrease in their packed cell volume compared to the normal. This might be attributed to many factors which could include loss of blood to burns, marrow dysfunction in musculoskeletal pain secondary to chronic disorders or nutritional anaemias due to loss of certain nutritional haemopoietic requirements due to age. The mean for the total white blood cell count was within the normal range and there was no significant increase or decrease in values obtained.

In this study, differential leucocyte count was normal suggesting the lack of association of increased thrombopoiesis in usculoskeletal pain with other blood cells.

Conclusion

It can be inferred from this study that there is increase in absolute platelet count m adult patients with musculoskeletal pain associated with chronic conditions and some malignancies which can be a good pointer in patient diagnosis, especially m patients with prolonged infection. Patients with musculoskeletal pain without any underlying condition only manifest with significant increase in absolute plat; value in very few conditions involving burns, injury and haemorrhage

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