



Short Communication

A Subjective and Objective Analysis of Pain in Female Brick Kiln Workers of West Bengal, India

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Abstract:

Work related musculoskeletal disorders are a common cause of pain in female workers in brick manufacturing industries involved in sorting and stacking process.

This study aims to categorize the component of neuropathic and/or nociceptive pain with reference to chronic low back pain, its probable causes and its impact on functional variables like hand grip strength, number of man days lost etc.

Female subjects [n=220] in the age range of 28-45 years from different brick fields of Hooghly and Birbhum district of West Bengal, India with a work experience of more than 10 years participated in this study. Pain categorization was done by PAIN DETECT TOOL. Hand Grip dynamometry done to evaluate grip strength. NIOSH equation was used to standardize RWL.

It showed that pain/discomfort was mainly at the low back(90%), neck(72%) and wrist(62%). 72% of workers had a pain of >20 in the pain scale of the pain detect tool & 80% of workers were not satisfied with treatments with analgesics/antipyretics which indicate the involvement of neuropathic component of pain in them. The impact of pain was revealed on functional and productivity endpoints like reduced grip strength which also lead to absenteeism, loss of average man days[4.5/month], injuries[in 33% of workers] and monotony[85% workers]

The probable cause of the chronic low back pain may be due to radiculopathy from repetitive lifting of bricks over and above the Recommended Weight Limit [Lifting Index 1.8].

Key Words: WMSD, Neuropathic pain, Pain Detect Tool.

Introduction

Brick is a very important building material for a developing country, especially like India to improve infrastructure. The majority of new buildings use bricks, and construction is the symbol of improvement in the urban sector. However, the reality is that people, who work with this rough material, will never be able to own a development

themselves; sometimes they don't even have enough money for a meal. They earn money on the amount of bricks they shift, rather than hourly, which encourages them to work from dawn till dusk; the workers are treated as machines than humans[1]. The Indian brick industry is the second largest in the world after China, employing large numbers of migrant workers including men, women and even children[2].

Work related musculoskeletal disorders are a common cause of pain in female workers in brick manufacturing industries involved in sorting and stacking process. They not only cause human

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suffering but are economically costly as well due to reduced working capacity and lessened production. WMSDs are a range of inflammatory and degenerative diseases resulting from forceful, repetitive and long duration jobs resulting in pain/discomfort and functional impairment and may affect body's soft tissues, tendons, tendon sheaths, muscles, nerves of hands, wrists, elbow, shoulder, neck and low back[3]. Among such disorders pain of neck, shoulders and low back cause long periods of disability and sick leave.[4]. WMSD exacerbate due to the nature of the job but is not the sole causation effect of the job like force, repetitiveness, duration and psychosocial factors.[5]

The present study concentrated on female brick kiln workers of West Bengal, India to find out the prevalence and nature of the WMSDs.

There has been a plethora of subjective data in these workers across the globe regarding pain localization in different parts of the body but no objective analysis regarding

categorization of pain exists. This study aims to categorize the component of neuropathic and/or nociceptive pain with reference to chronic low back pain, its probable causes and its impact on functional variables like hand grip strength, number of man days lost etc.

On the basis of data from previous studies the subjective analysis was done to focalize pain by physical examination and semi structured interviews on the basis of which objective analysis was performed to quantify pain and classify them according to the involvement of the neuropathic or nociceptive component in the examined subjective WMSD and confirmation was done through Clinician's therapeutic approach review on these workers. To be specific the following end points were to be evaluated:

- a. Subjective analysis: prevalence of self reported pain/discomfort among brick field workers.
- b. Identify the most affected body regions.
- c. Objective analysis of pain- nociceptive or neuropathic? & its severity
- d. Impact of pain on productivity. [loss of man days]
- e. Impact of pain on functioning of body parts.[hand grip strength]
- f. Measure the burden of work as reflected from RWL and Lifting Index.
- g. Suggestive measures to improve work environment
- h. Chronic energy deficiency which adds to the burden of illness.

Methods

Subjects: Female subjects [n=220] in the age range of 28-45 years from different brick fields of Hooghly and Birbhum district of West Bengal, India. Inclusion Criteria : Female workers with employment more than 10 years. Exclusion criteria : Osteoarthritis, Pain and fever from viral infections recently [within 7 days], recent orthopaedic injury beyond workplace. Semi-structured interviews and Physical examination was done in the Clinician's chamber away from the workplace for approximately 20 minutes / individual. Frequency and descriptive analysis of subjective data was done through MS-Excel.

Height, weight, age, gender, duties of job, working hours were taken by standard protocol. Subjective analysis was done on a 10 point Borg Scale matched to Comparative pain scale. Objective Analysis of Pain: Pain Detect Questionnaire to find out nociceptive or neuropathic component [6] [Appendix-1]

Body Mass Index was found from height and weight measured by Anthropometer and Weighing machine. Use of NIOSH lifting equation to calculate RWL and Lifting Index and grip strength done by Hand Grip Dynamometer. Exertion was calculated from Rate of Perceived Exertion Scale [Appendix-2] which subjectively describes the feeling of the individual for the performance of the job [tiredness/cannot sustain the job for a specified duration] on a 15 point scale from 6 to 20 and each value carries the degree of exertion.

Results

Table 1 indicates the physical and physiological variables with an increased pulse rate and a marginally lower blood pressure. Though average BMI suggests no chronic energy deficiency but [37% of the population suffers from some grade of CED and 1.3% is actually overweight]

Table I Physical and physiological variables

Parameters	Values
Stature [cm]	158.7 + 9.8
Weight [Kg]	45.5 + 4.2
Systolic Blood Pressure[mmHg]	114+9.2
Diastolic Blood Pressure[mmHg]	72 + 7.8
Pulse Rate[bts/min]	86 +11
BMI [kg/m ²]	18.2 + 0.23

Figure 1. Subjective Pain analysis on 10 point Borg Scale [response from 3 to 10]

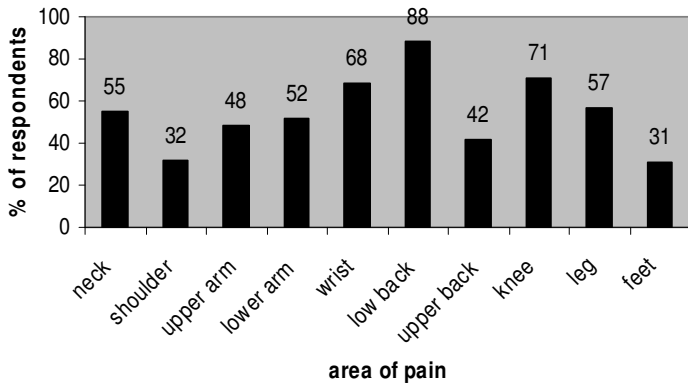


Figure 2. Pain felt mostly during past 12 months

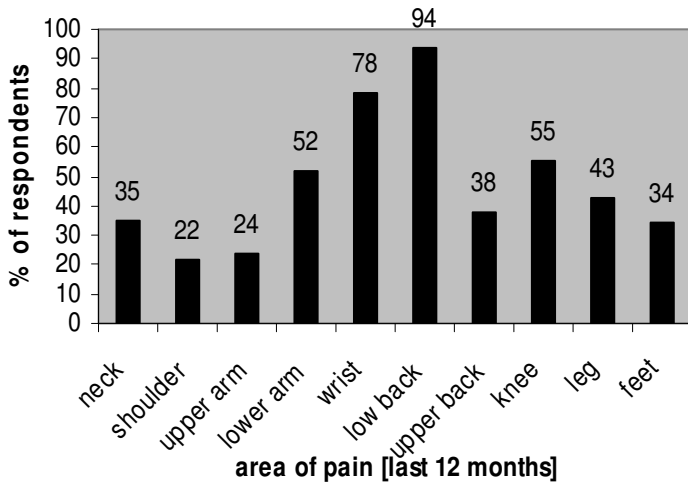


Figure 3. Work prevented mostly due to pain/discomfort of body parts.

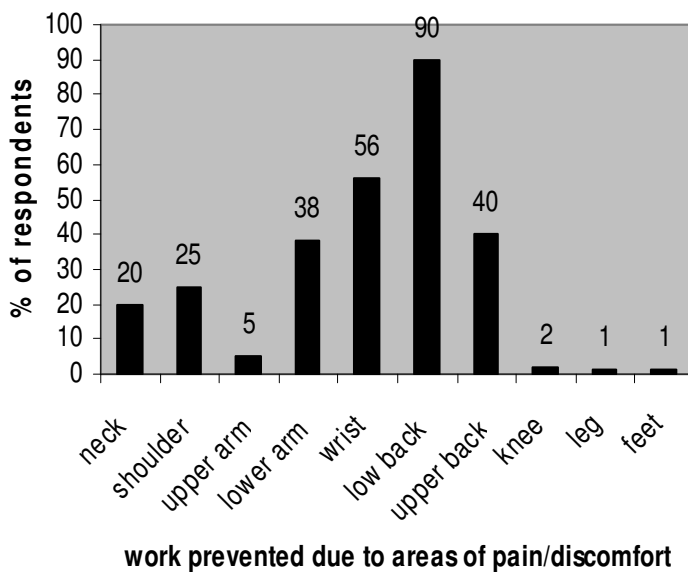


Figure 1,2,3 suggests the most affected part is the low back due to load on the vertebral column from where it radiates to neck and shoulders and is chronic in nature.

Figure 4. Denotes % of sufferers requiring physician intervention

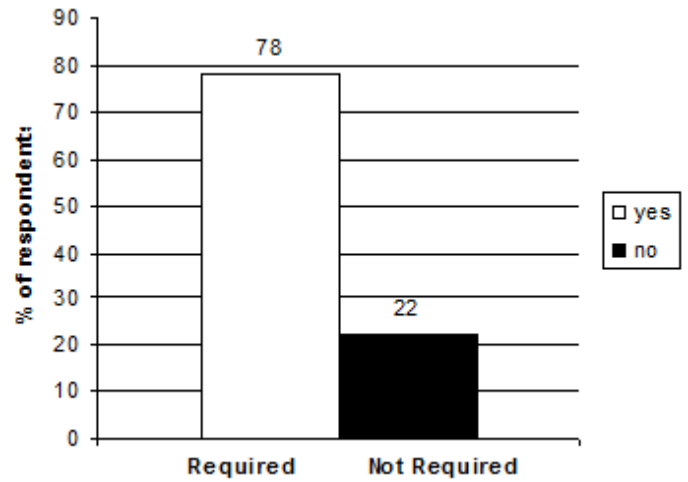


Figure 4 explains that 78% respondents needed to visit the onsite physician for pain relief which interfered with their productivity. Figure 5: signifies that treatment was ineffective and they suffer from acidity after taking the pain killers.

Figure 5. Treatment satisfaction after physician intervention.

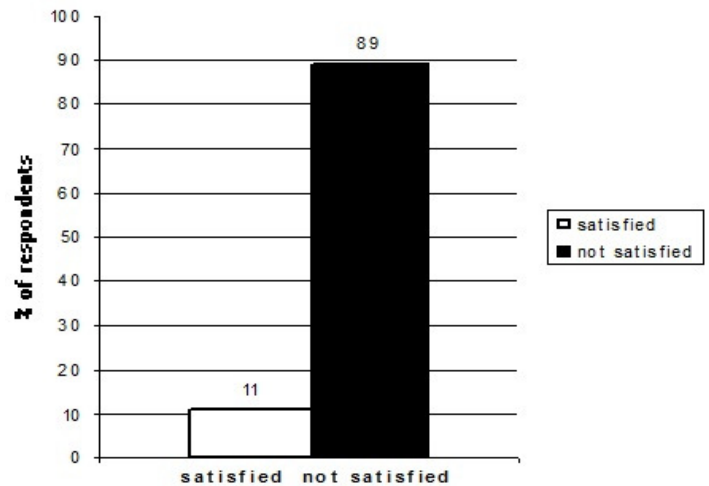


Figure 6. Physician's diagnosis and perception of type of pain component involved.

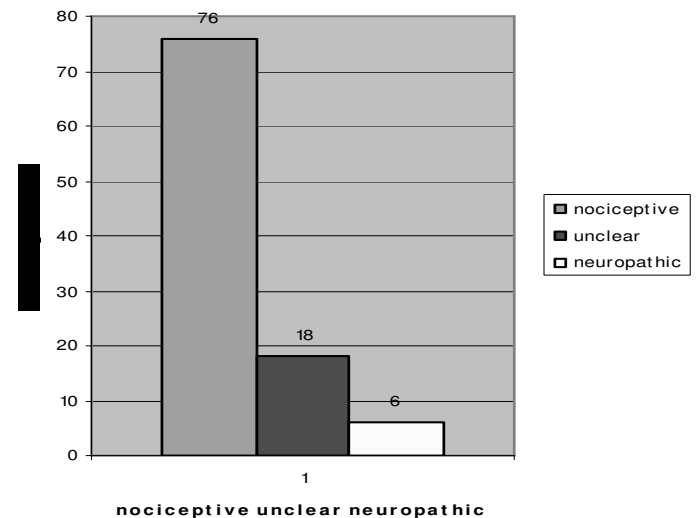


Fig 6 narrates the Physician's perception that they suffer from nociceptive pain due to poor postures, suffer accidents, mainly responds to analgesics like ibuprofen and paracetamol.

Figure 7. Percent of Individuals treated with Non Steroidal Anti-inflammatory drugs [paracetamol / ibuprofen].

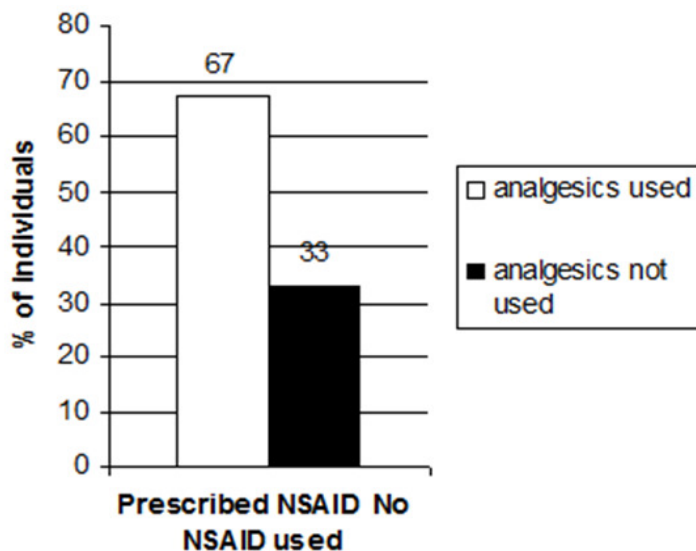


Figure 7 suggest that the physician prescribes in 67% analgesics and rest with exercise but he have never explored neuropathic component. Figure 8 suggests after using the Pain Detect Tool he felt that a neuropathic pain component can be likely.

Figure 8. Physician's diagnosis of pain components after using pain detect tool

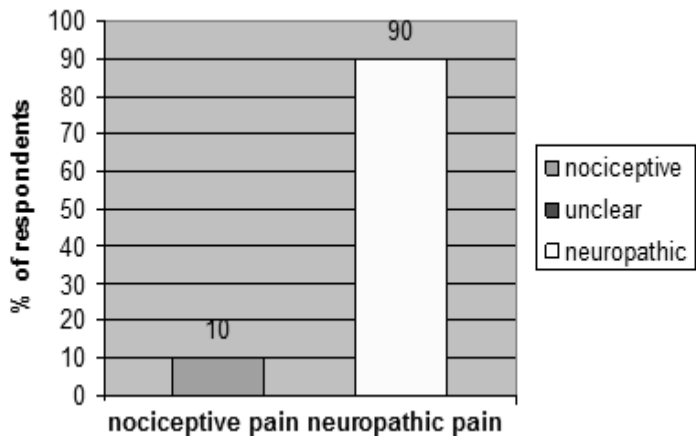


Figure 9 suggests the functional compromise of these workers due to pain which exposes them for more nociceptive pain as they have to grip the necessary bricks. Figure10 and 11 suggests that they carry actually a load over and above the target lifting index for more money which makes them injury prone. Figure 12 indicates though average BMI is less than controls but still suggests no chronic energy deficiency but 37% of the population suffers from some grade of CED and 1.3% is actually overweight].

Figure 9. Comparison of average grip strength of female workers vs predicted value based on height, weight population nomogram. [$p < 0.001$].

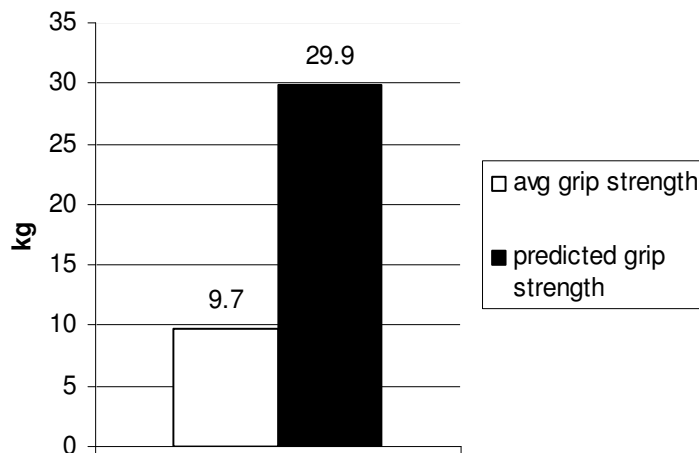


Figure 10. Comparison of Actual weight lifted against Recommended Weight Limit.[NIOSH equation].

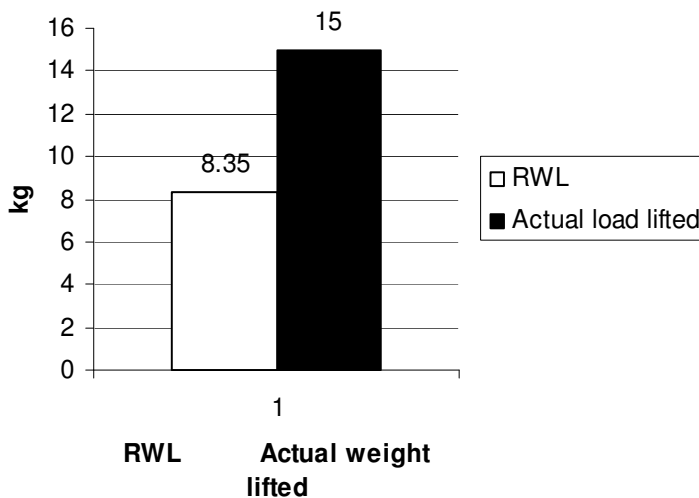


Figure 11. Comparison of target and actual lifting index .

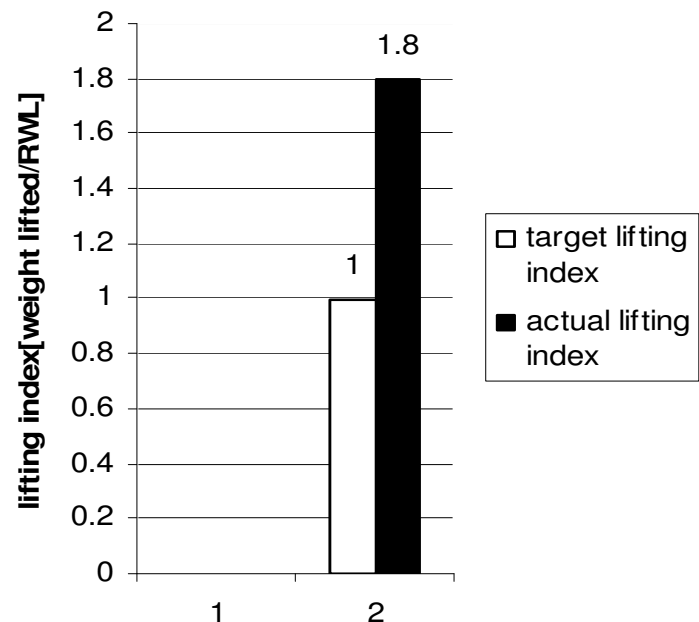


Figure 12. Comparison of BMI of brick kiln workers and controls from same socio-economic status .

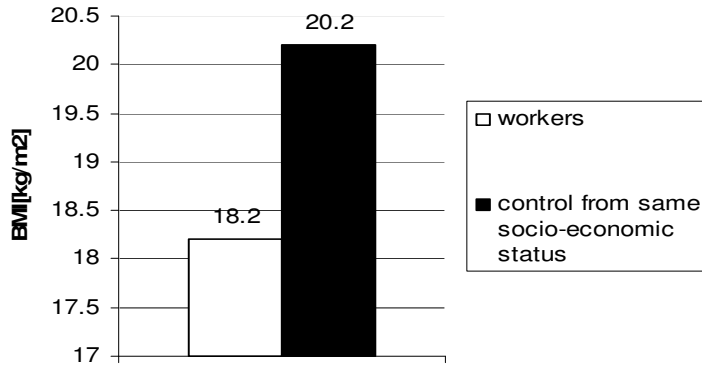
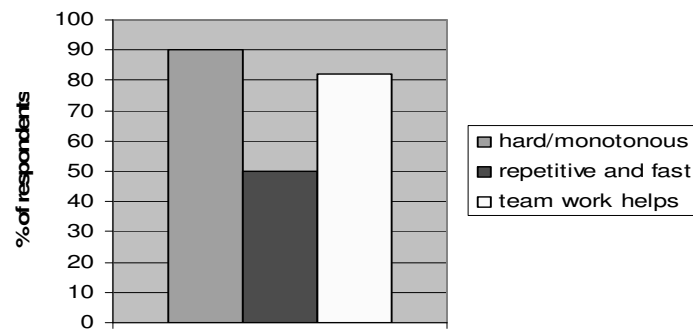


Figure 13 indicates the workers felt the job to be boring and hard and aggravates the sensation of pain

Figure 13. Comparison of BMI of brick kiln workers and controls from same socio-economic status .



Discussion

Analysis of results depict that the pain/discomfort is felt maximally at the low back , wrists, neck and the low back pain is chronic in nature. The latter is the main cause which prevented them from doing work, led them to be absent from work, culminating in the reduced productivity at the industry. The pain detect tool showed a pain score >20 in 90% of affected individuals mainly with low back pain, and that is why 89% of respondents were dissatisfied with treatment. This is because the physician's evaluation was opposite i.e. he perceived mostly nociceptive component of pain and treated with common analgesics/antipyretics available in the Indian Pharma- market. They included 650mg paracetamol tablets with H2 blockers and mostly NSAIDS like ibuprofen, diclofenac were used. Moreover there was a lack of compliance of the medicines due to multi-dosing and also affordability sometimes are an issue . Analgesics are ineffective in treatment of neuropathic pain. Development of neuropathy may be due to radiculopathy which is again due to compression of spinal nerves as load lifted is more than RWL. Poor postures added to the agony of these workers and caused RSI .

One of the reason being the Lifting Index is doubled.[1.8 vs 1] and also there is lack of load distribution. BMI is also found to be low in the female workers than the control women which makes the job more stressful and adds to the menace of work related musculoskeletal disorders. The impact of WMSD can be felt that the measured hand grip strength were much lower in female workers than their predicted values which might cause difficulty in load lifting, decreased productivity and even cause accidental slippage.

Therefore, following suggestions may be provided to these helpless workers to improve their quality of life.

1. Workers should be screened for neuropathic component for chronic low back pain by neuro-radiological findings and be treated accordingly with neuropathic pain relieving drugs like pregabalin.
2. They should be discouraged to take analgesics at random as it will not work in them. The amount of load lifted must be equal to RWL and a targeted Lifting index of at least 1 should be achieved.
3. Work containerization and Time study must be conducted to measure productivity and team efforts and job rotation should be employed to decrease the feeling of monotony during work hour in the workers..
4. Diet survey must be carried among these workers to find how much calorie deficiency they are suffering from and accordingly their nutritional status may be improved.
5. OWAS should be conducted for postural analysis and redesign the load carrying job by pulling carts etc. so that spinal compression is minimized.

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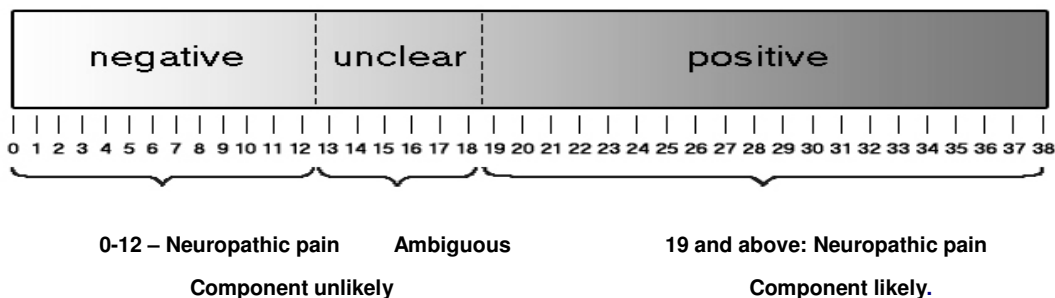
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Appendix-1

Pain Detect Tool

1. Subjective feeling	never 0	Hardly noticed 1	slight 2	moderate 3	Strong 4	very strong 5
Do you suffer from a burning sensation (e.g., stinging nettles) in the marked areas?						
Do you have a tingling or prickling sensation in the area of your pain (like crawling ants or electrical tingling)?						
Is light touching (clothing, a blanket) in this area painful?						
Do you have sudden pain attacks in the area of your pain, like electric shocks?						
Is cold or heat (bath water) in this area occasionally painful?						
Do you suffer from a sensation of numbness in the areas that you marked?						
Does slight pressure in this area, e.g., with a finger, trigger pain?						
2. Whether Pain Radiates from origin [if yes +2 to score]	+2/or 0					
3. Type of pain	Score					
a. persistent pain with fluctuations between	0					
b. . persistent pain with pain attacks between	-1					
c. Pain attacks without pain	+1					
d. Pain attacks with pain between them.	+1					

Calculation : Add the total score of 1+2+3 and evaluate it on the pain scale



Appendix-2

Rate of Perceived Exertion Scale

score	Rate of Perceived Exertion
6	no exertion
7	
8	extremely light
9	very light
10	
11	light
12	
13	somewhat hard
14	
15	hard
16	
17	very hard
18	
19	extremely hard
20	maximal exertion