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"A survey on habitual and occupational musculoskeletal disorders for analysis of any ergonomical involvement"

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Abstract: A technological revolution and globalization has brought a huge change in daily activities. With inculcating luxuries and comfort into life, it has brought habitual and occupational disorders such as musculoskeletal disorders like arthritis, stresses, blood pressures, asthma, and so on.
The severity of the musculoskeletal disorders (MSD) depends on the various factors such as age groups, work background, food habits, Gender, overweight and obesity, occupation, Physical activities. Therefore there is need to assess the triggering parameters for the disorders based on the above factors and infer the recommendations to overcome the disorder and there by enhance the ease and comfort healthy life**.** This paper focuses on the survey of various age groups for their different daily activities and draws the inference which helps in designing an ergonomical solution for these MSD's and increases the comfortness and ease of the victims, it evaluates actions that can be performed in the workplace.
Keyword: musculoskeletal disorders (MSD), Ergonomics, Risk factors, Interventions, Exclusion criteria.

Introduction

Work-related musculoskeletal disorders (MSDs) are impairments of body structures such as muscles, joints, tendons, ligaments, nerves, bones or a localized blood circulation system caused or aggravated primarily by the performance of work and by the effects of the immediate environment where the work is carried out. Most work related MSDs are cumulative disorders, resulting from repeated exposures to high- or low-intensity loads over a long period of time. The symptoms may vary from discomfort and pain to decreased body function and invalidity. Although it is not clear to what extent MSDs are caused by work, their impact on working life is huge. MSDs can interfere with activities at work and can lead to reduced productivity, sickness absence and chronic occupational disability.
Musculoskeletal disorders (MSDs) are the most common work-related health problem, affecting millions of workers. Across the world, 25% of workers complain of backache and 23% report muscular pains. MSDs are the biggest cause of absence from work in practically all Member States. In some states, 40% of the costs of workers' compensation are caused by MSDs and up to 1.6% of the gross domestic product (GDP) of the country itself. They reduce company profitability and add to the government's social costs. The challenge of work-related health problems, including musculoskeletal disorders, has been recognized bodies such as the Agency for Safety and Health at Work to support occupational safety and health activities across world. Creating more and better quality jobs is an important objective pain, discomfort and loss of function in back, neck and extremities are common among working people. These ailments are commonly termed musculoskeletal disorders (MSDs). For the purpose of this report, work-related MSDs are defined as impairments of body structures such as muscles, joints, tendons, ligaments, nerves, bones or a localized blood circulation system that are caused or aggravated primarily by the performance of work and by the effects of the immediate environment where the work is carried out. Most work-related MSDs are cumulative disorders, resulting from repeated exposure to high- or low-intensity loads over a long period of time. However, MSDs can also be acute traumas, such as fractures, that occur during an accident. The symptoms may vary from discomfort and pain to reduced body function and invalidity. MSDs cause harm and suffering to the worker as well as financial loss owing to invalidity, treatment costs and lost income. They also have an enormous negative impact on society as a whole. At the workplace level, the disorders result in costs due to reduced human capacity and disturbances to production. The costs to society are increased due to the need for treatment and rehabilitation, in addition to the compensation costs paid through social insurance.

EVIDENCE ON THE EFFECTIVENESS OF WORK-RELATED INTERVENTIONS RISKFACTORS

Hundreds of epidemiological studies have demonstrated clearly that a number of factors increase the probability of developing MSDs. A common way of classifying these risk factors has been to separate the individual factors from the external factors (exposures). Many of the external factors occur both at work and in leisure time activities. The biological processes leading from the risk factors to the MSDs are not well known, but it is obvious that the individual and external factors interact, i.e. the disorders are a result of several combinations of individual and external factors. Due to the wide individual variation it is difficult to make predictions on an individual level, though the relative magnitude of external risk can be assessed.

CONTROLOF RISKS

Reducing the occurrence of risk factors should, in theory, lead to a reduction in MSDs even without knowing the exact process from the risk factors to the disorders. Based on epidemiological studies, it is possible to estimate how much each factor contributes to the origin of MSDs. The attributable fraction of a risk factor describes the size of the proportional reduction in the occurrence of the disease when the risk factor is removed and with no change in the other risk factors. The higher the attributable fraction, the greater is the potential for prevention by omitting the factor. The variation (range) of the attributable fraction is due to the differences in the populations and the factors investigated in individual studies.

The risk factors for low back pain, manual material handling includes several other factors included (frequent bending and twisting, heavy physical load, static postures and repetitive movements). In most epidemiological studies, disorders of the upper extremities have also been attributed to manual material handling and forceful repetitive movements. Managing these risks would appear to have significant potential for prevention, omitting them might reduce the occurrence of the most common work-related disorders in the best case by up to two-thirds or three-quarters. In the worst case, the reduction should be 10-20%.

The relatively high attributable fractions imply that there is considerable potential to prevent the occurrence of MSDs through workplace interventions. Although the workplace cannot act directly on the individual factors (e.g. body build, gender, age) there remains the potential to act on some individual factors by promoting the healthy behavior of workers. In addition to back and upper limbs, the lower limbs can also be affected. The main risk factors of work-related lower limb disorders include squatting, kneeling, pushing on pedals and prolonged standing. However, scientific literature on work-related lower limb disorders is scarce.

SCIENTIFIC EVIDENCE

In theory, reducing the risk factors should lead to a reduction in MSDs. However, experience has shown that not all theoretically beneficial actions fulfill their expectations and the results can even be opposite to the expected results. Therefore, it is important to evaluate the actions (interventions) to see if the effects are the expected ones. There are several ways to do this. In daily life, the evaluation happens usually by direct experiences. However, formal evaluation asks for measurement showing that there is a difference in the outcomes measured before and after the intervention. In real life, there are continuous changes in the environment. It is also well-known that a number of musculoskeletal symptoms may be alleviated without formal intervention. In experimental studies, there is always some bias, i.e. some systematic error in the measures or just random variation in the results. To be able to make general conclusions on the effects of interventions, it is important to make an evaluation in a valid test setting that will reduce the bias as much as possible. The best way to obtain generally valid evidence on the effects of interventions concerning health is to have a comparison group in addition to the intervention group. The most rigorous setting for the testing is a randomized controlled trial (RCT) - the 'gold standard' for the testing of health interventions. Experience has shown that similar interventions can give different effects when repeated in the same population and that the difference can be even greater in another population. Today, the evaluation of interventions in medicine is based on systematic reviews that derive conclusions from the evidence on the basis of a number of original studies. The Cochrane Collaboration (3) has developed a standardized methodology to produce reviews in the most reliable way, the methodology includes,

Each included report is usually evaluated by several independent specialists to provide a more reliable interpretation. In real life, evaluation of interventions with RCTs in a sophisticated scientific way is not always feasible. 'Evidence based' thinking in medicine admits this and therefore the evaluation of evidence can be based on a number of kinds of study settings. But when combining the results in the systematic review, the reports have to be evaluated for the scientific quality of the study with respect to the potential bias; i.e. how big the possibility that the results are affected by factors other than is the intervention studied. In the conclusions of the reviews, most weight is given to the most reliable studies with the lowest potential bias. If the scientific evidence is insufficient, the recommendations for good practice are based on the consensus of experts. History has shown that a number of good practice recommendations have been changed dramatically by the results of

good quality studies, for example, a couple of decades ago the medical textbooks recommended bed rest as the treatment for low back pain.

OBJECTIVE OF WORK

This paper focuses on the survey of various age groups for their different daily activities and draws the inference which helps in designing an ergonomical solution for these musculoskeletal disorders (MSD) and increases the comfortness and ease of the victims. , it evaluates actions that can be performed in the workplace. The aim of this work is to study on:

- The role of ergonomics in preventing work related MSD disorders and investigate the research on the prevention of work-related MSDs.
- To analyze the feelings of focused group in terms of the topic
- To implement the Delphi techquinices to the assessment for the field of study(Experts opinions)
- To design and develop ergo solutions scientific models to analyze (In Future)

INTERVENTIONS INCLUDED

This review report includes intervention studies on MSDs in all parts of the body. The definition of the health outcomes varies in the original reports from well-defined clinical diagnoses to the reported symptoms of pain or discomfort. In the results of the review, the findings are grouped according to the following anatomical areas:

• Low back
• Neck and upper limbs
• Lower limbs.

To be selected, the interventions in the studies had to be targeted on the working system (e.g. ergonomic interventions on the physical environment, tools, methods, work organization) or the mechanisms to handle the related problems at the workplace (e.g. training of workers, operational management of work). Interventions aimed at the treatment of individuals outside the boundaries of the working system are excluded. The scope of the review is the prevention of MSDs. Therefore the outcomes of the included studies are related to the health of the musculoskeletal organs. With MSDs, this classification is problematic because the definition of disorders has usually been based on reported symptoms and there are nonmedical means to define exactly the onset of diseases related to degeneration (e.g. most of the adults without back pain had anatomic findings of disc degeneration when studied with the latest imaging methods). In the interventions performed at the workplace, it is difficult to exclude people with a history of past pain in order to study mechanisms for primary prevention because the proposed means will obviously also help to prevent the recurrence of pain. Therefore, this review has included studies on both primary and secondary prevention because most of the original studies included all workers within the workplaces investigated. There is also some overlap between secondary and tertiary prevention. Some of the studies included in this report are thus the same as those in the corresponding review being undertaken for the Agency's recent Work related MSDs, only those studies using valid study design are included in the review. Because there are few studies with a randomized setting, the minimum requirement to be included is that there was a comparison group in addition to the intervention group.

EXCLUSION CRITERIA

Case study reports have been excluded from this review. The number of case studies is large and some new experiences are described in the second part of this report. The trials that concentrate mainly on treatment or rehabilitation have also been excluded. They are reviewed in the Work-related MSDs

LOW BACK

Organizational and administrative interventions.

Daily working hours were reduced from more than seven hours to six hours in physically demanding care work in three cities in Sweden and Norway Reduced neck and shoulder pain was observed, but not low back pain.

Technical, engineering or ergonomic interventions.

The effects of measures to reduce the physical load in manual handling have been well studied in the laboratory, but the number of field studies with comparison groups is small. In a critical review of 18 such studies by van derMolen seven out of eight studies involving only engineering controls (e.g. mechanical aids) found a reduction in physical work demands. Six studies that involved engineering and organizational controls also showed a decrease in workload. Ten studies that reported the effect on MSD symptoms did not show consistent results. One 'high quality' study reported a decline in the incidence of low back disorders. All four of the controlled field studies showed a significant reduction in physical work demands when lifting devices were part of the intervention. Two of these studies measured a significant reduction in low back disorders in the longer

term. Other recent studies confirm these findings. Working height adjustment and transport mechanization resulted in lower physical loading and a reduction of back complaints without the loss of productivity in construction work. A new good quality study in the construction industry showed that using a new bricklaying method reduced workload on the back and shoulders. The workers were satisfied with the new method, but there was no clear difference in the MSDs between the intervention and comparison groups. A slight decrease in sickness absence was seen in the intervention group. In a health care programme, introducing ergonomic consultation and financial support for purchasing ergonomic devices also resulted in decreased rates of MSDs, although the study had no control group (Fujishiro et al., 2005). There appears to be strong evidence that the introduction of ergonomic improvements may reduce the physical workload.

Physical Exercise

The risk of back pain increases if there is a discrepancy between the workload and the physical capacity of the person doing the work. This mismatch can also be reduced by improving the physical capacity of workers. Therefore, actions to promote health and physical activity have been advocated (Hayden et al., 2005). Physical training has also been an essential part of the rehabilitation of patients with back In a review of interventions for low back in the workplace, six comparative studies on exercises were identified but all had potential bias In four of these reviews, positive effects were found on low back pain, new episodes of back pain, sick leave or economic savings. Another review made similar conclusions thus there is moderate evidence that physical exercise is beneficial in the prevention of low back disorders.

Neck and upper limbs.

Disorders of neck and upper limbs are common in many manual tasks and in physically light office work with computers (see below under Office Work). The need for high muscular force in gripping as well as repetitive movements and poor postures have all been found to be work-related risk factors for the development of MSDs in manual work.

Technical, Engineering or Ergonomic interventions.

A critical review from 2001 considered conservative treatment (treatment not involving surgery) modalities in repetitive strain injuries, but no 'good quality' studies on ergonomics in manual work were found. Another review identified only one study with a concurrent comparison group in aircraft manufacturing (Melhorn, 1996). Unfortunately, the report of this study does not give data on the occurrence of MSDs but only mathematically constructed figures describing risk. Vibration of hand-held tools is another well-known risk for upper limb disorders. Standards regulating the manufacturing of tools have been introduced (e.g. ISO standards) while EC Directive 2002/44 (7) regulates the use of vibrating tools. A study followed the effects of a four-year intervention programme where new tools and ant vibration gloves were introduced in a construction company (Jetzer et al., 2003). Measures related to the health effects of vibration were slightly more improved in the intervention groups than among the workers who did not use the new tools or gloves. There are many laboratory studies on engineering interventions in the ergonomic literature. In laboratory studies, many technical tools and working techniques have shown benefits with respect to the loading on the musculoskeletal system. However, these studies have had very short periods of exposure duration and/or follow-up, possibly only a few hours or days. This limits the applicability of the study results to real life working situations. In manual handling, reduction of the loads to be handled reduces the exposure of the back and also of the shoulders and upper limbs. The intervention studies on manual handling have concentrated mainly on reducing low back pain or have used general terms describing MSDs. No studies related to neck or upper limbs were found.

Protective Equipment.

Splinting of the wrists has been proposed for the treatment of repetitive strain injuries no studies were found concerning the preventive effectiveness of splints.

Behavioral Modification.

Physical exercises have been recommended for the prevention and treatment of neck and shoulder disorders, although previous studies have not shown them to be effective Strengthening of the muscles for months was shown to be effective among women with chronic non-specific neck pain who were still working in an office despite their disorders (Ylinen et al., 2003). A similar effect was seen when the original comparison group repeated the programme after the end of the original trial (Ylinen et al., 2006). In another 'good quality' trial with a similar group of women, no effects of exercising were observed However, there was a clear difference in the intensity of training between these two trials. In the one that was effective, the participants trained intensively for 30 minutes three times a week for 12 months, and an increase of muscle strength was seen. In the other trial, similar advice to train was given but most of the participants exercised much less. It appear that the

exercises have to be intensive enough (half an hour three times a week for several months) in order to effectively alleviate neck disorders.

Lower Limbs.
Only one study on the prevention of disorders in lower limbs was identified when shock-absorbing and biomechanical shoe or those were tested in military service, users had less back and lower leg disorders than non-users. But because care-seeking for lower extremity problems is rare, the use of this kind of custom-made or thesis for prevention of MSDs in military conscripts would be too costly for wider application.

Office work.
MSDs of the neck, shoulders and upper limbs are common among workers using computers. Although the risk of well-defined disease is minor compared with the traditional occupations with repetitive manual tasks, the number of computer users is more than half the workforce in many countries. This results in a very large total number of workers with MSDs. The Directive on computer work aims to reduce the risks. Its recommendations are to adjust the workstation and tools according to the needs of the users, and to train workers to use tools and software properly. The effects of interventions in computerized work have been studied in numerous reports. General reviews on the effectiveness of interventions on MSDs of the neck and upper limbs have also evaluated interventions in an office environment a recent review evaluated over 350 reports related to computer work

Organizational and administrative interventions.
Working hours, breaks in physically demanding care work, daily working hours were reduced from more than seven hours to six hours the subjects were compared with workers in similar workplaces who did not benefit from a reduction in working hours. In all intervention groups, the occurrence of neck-shoulder pain was reduced by 15%. No reduction in pain was observed in the reference groups. The prevalence of back pain did not show the same consistent pattern. Extra breaks within the working day have been introduced in some trials, although their long-term effects have not been studied. In a trial in a meat-processing plant, the introduction of four nine-minute breaks distributed evenly over the workday for a week were found to reduce the discomfort in the lower limbs but not in other body Areas. The introduction of the breaks did not reduce productivity. In agricultural harvesting, five-minute rest breaks were introduced every working hour and workers in the experimental condition reported significantly less severe symptoms than workers in the control groups
There are few studies on these interventions. There is limited scientific evidence that a reduction in daily working hours from more than seven hours to six hours can reduce neck and shoulder disorders in physically demanding health care work. There is also evidence that it is possible to introduce additional breaks into repetitive work without loss of productivity. It is not known how the breaks should be organized in order to prevent the occurrence of MSDs most effectively.

Social survey on habitual and occupational activities

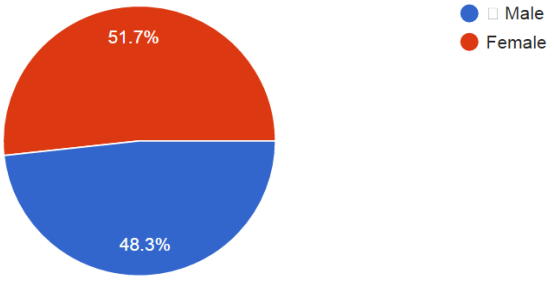
An online and offline survey has been made with different age groups by sending 35 questions based on their habits, ethnic origin, personal details, and health issues. The offline survey was done with the patients of OPD in the Bilwa hospital, Malleswaram, Bengaluru. In the online survey we received 61 responses out of which 31male and 30. female responders of different age groups, similarly in offline 39 responses we got out of which 21 females and 18 male responders of the age groups between 35-65 yrs. The graphical representation of the obtained responses along with questionnaires is tabulated below. The observation from the survey gives inference that most of the female patients are prone to musculoskeletal disorders due to the hormonal problems and the work pressure. The most of the male patients are prone to musculoskeletal disorders due to work related pressure, posture, habit and due to food habits.

Online Survey (61 Responses)

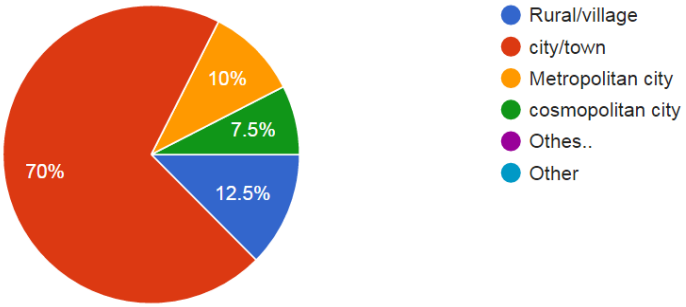
SUMMARY | INDIVIDUAL

Accepting responses

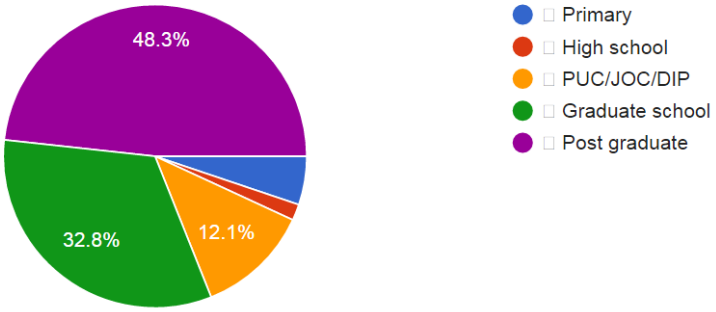
1. Gender (58 responses)



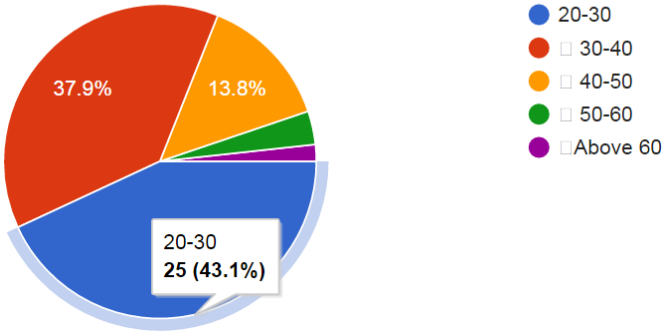
2. Ethnic origin (40 responses)



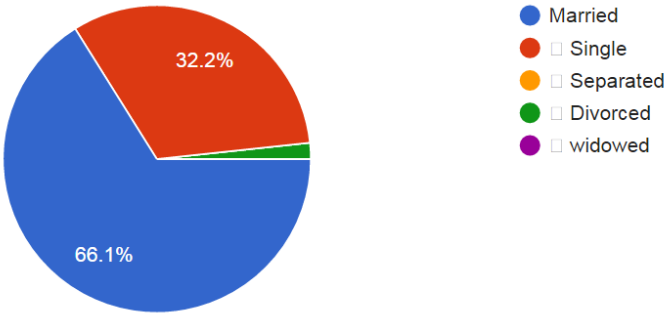
3. Please tick the highest year of school completed (Education). (58 responses)



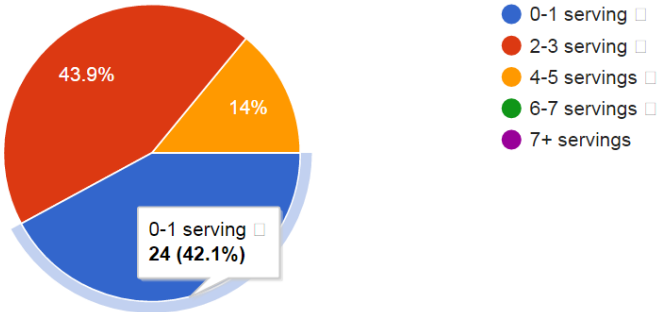
4. How old you are? (In years) (58 responses)



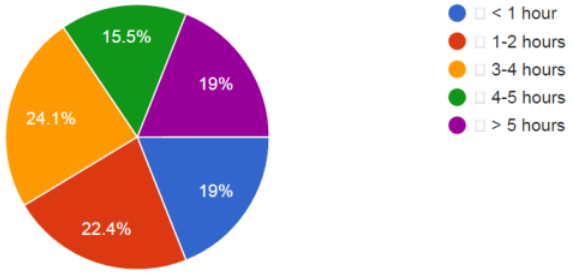
5. Marital status (Tick only one) (59 responses)



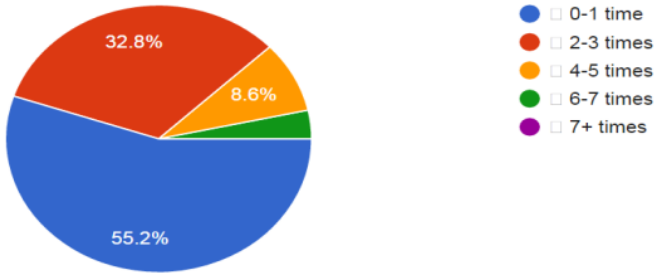
B. Health Habits 6. How many servings of Fruits and Vegetables do you eat per day?
(57 responses)



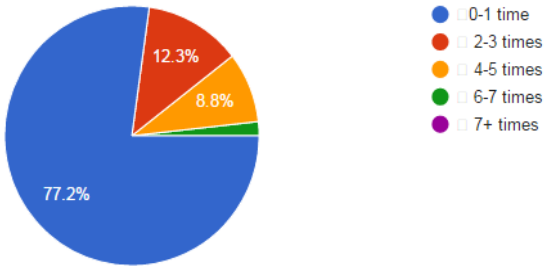
7. How many hours per day do you spend in front of screen (T.V/Computer)?
(58 responses)



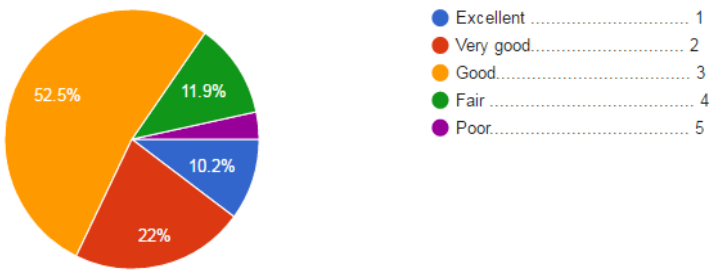
8. How many times per week do you eat takeout food (Restaurant/Fast Food)?
(58 responses)



9. How many sugar sweetened/Alcoholic drinks do you drink per week?
(57 responses)

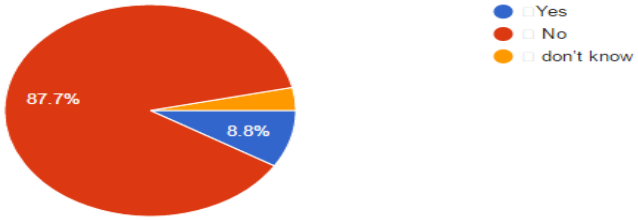


C. General Health 10. In general, would you say your health is? (59 responses)

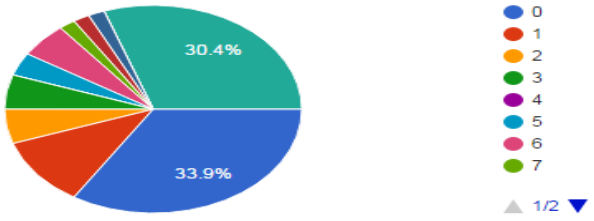


11. Please indicate below which chronic condition(s) you have: (23 responses)

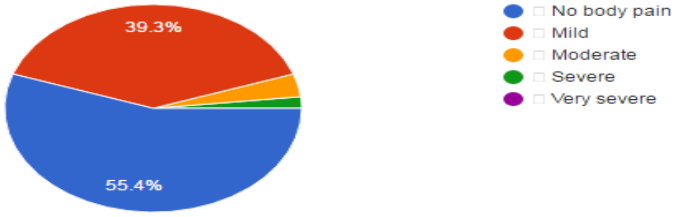
12. Do you have any other long term illness, physical or mental that has been diagnosed by doctor? A long term illness may be intermittent (episodic) Ex. Epilepsy, stomach ulcers, migraine or contionusoly present
(57 responses)



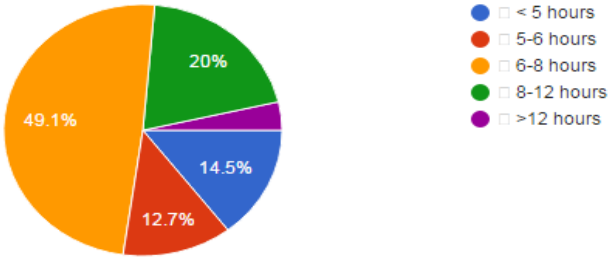
13. We are interested in learning whether or not you are affected by pain. Please Scale the number below that Describes your pain (scale) in the past 2 weeks.
(56 responses)



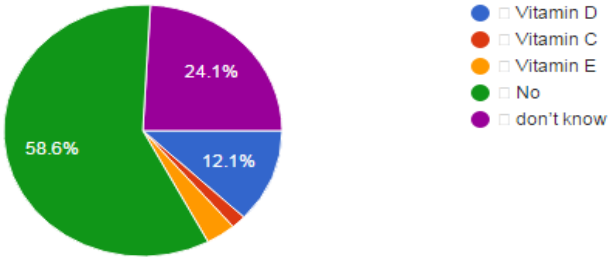
14. How much body pain (Knee or joint or any body pain) do you have during the past 4 weeks?
(56 responses)



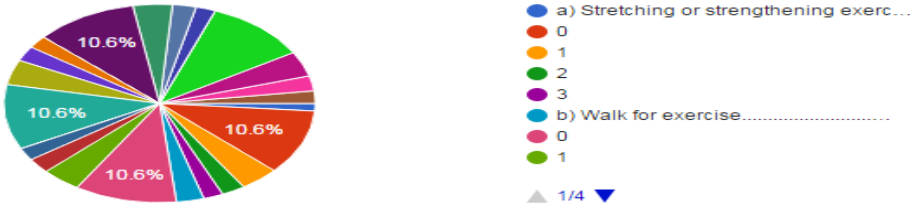
15. How many hours do you usually work in organisation? (Working hours)
(55 responses)



16. Are you suffering from any Vitamin deficiency? If yes mention which one.
(58 responses)

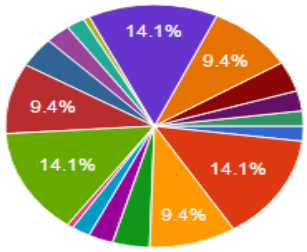


D. Physical Activities. 17. During the past week, even if it was not a typical week for you, how much total time (for the entire week) you spend on each of the following? (Please scale the number for each question). Null, less than 30-60 min, 1-3 hrs, More than 3hrs /wk.
(57 responses)



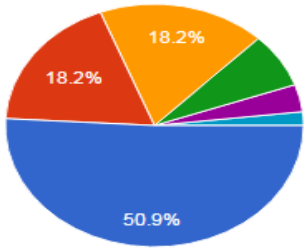
E. Daily Activities 18. During the past 2 weeks, how much... (Scale the rank) (Not, quite, almost, Slightly moderately, bit totally.)
(52 responses)

F. Medical Care 19. When you visit your doctor, how often you do the following (please Scale the number for each question): Almost, Rarely, never, sometimes often, always.
(53 responses)



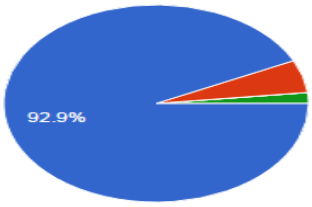
a. Prepare a list of questions for yo...
0
1
2
3
4
b. Ask questions about the things y...
0
1/3

20. In the past 6 months, how many times did you visit a physician?
(55 responses)



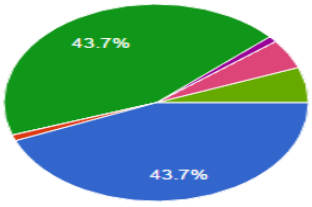
Null
1
2
3
4
5 and above

21. In the past 6 months, how many times did you go to a hospital emergency department.
(56 responses)



Null
1
2
3
4
5 and above

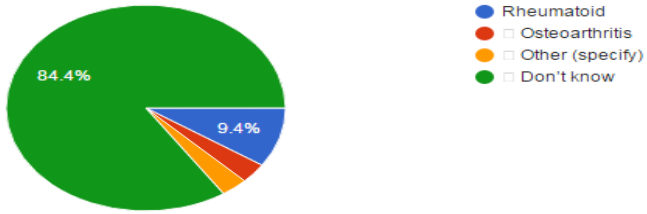
22. In the past 6 months, how many TIMES were you hospitalized? (57 responses)



Null
more than one night
a) How many total nights did you spend in the hospital?
Null
more than one night
c. Were any of these hospitalizations at a skilled nursing facility? (Conven...
Yes
No

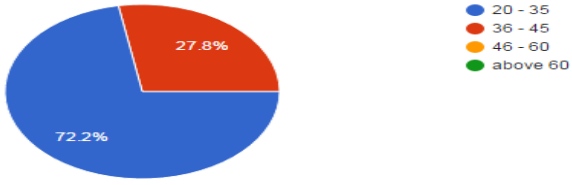
G. Arthritis 23. Have you ever been told by a doctor you have arthritis?
(53 responses)

24. What kind of arthritis was that? (32 responses)



25. Which joint was affected first? (34 responses)

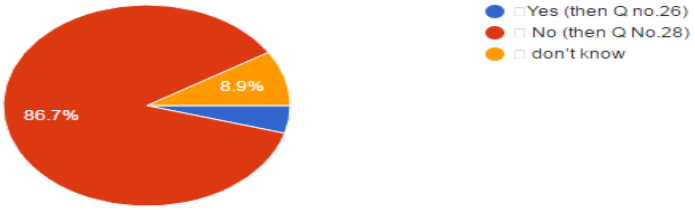
26. How old you were, when this was first diagnosed? (18 responses)



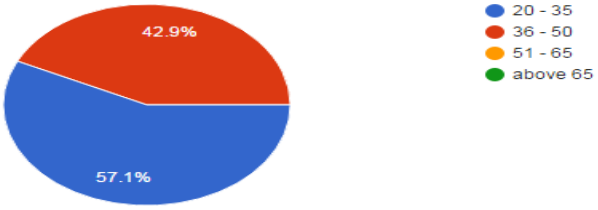
27. Which treatments do you now have for this? (31 responses)

28. Have you ever had an operation or surgery because of your arthritis?
(43 responses)

29. Have you ever been told by a doctor you have a disorder of the neck or back? This includes lumbago, sciatia, chronic back or neck pain, vertebrate or disc problems. (It can be injury-related or something you have were born with)
(45 responses)



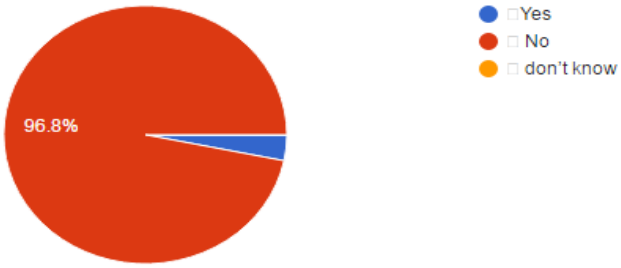
30. How old you were, when this was first diagnosed? (14 responses)



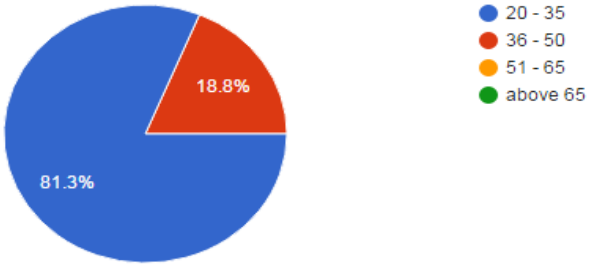
31. Which treatments do you now have for this? (29 responses)

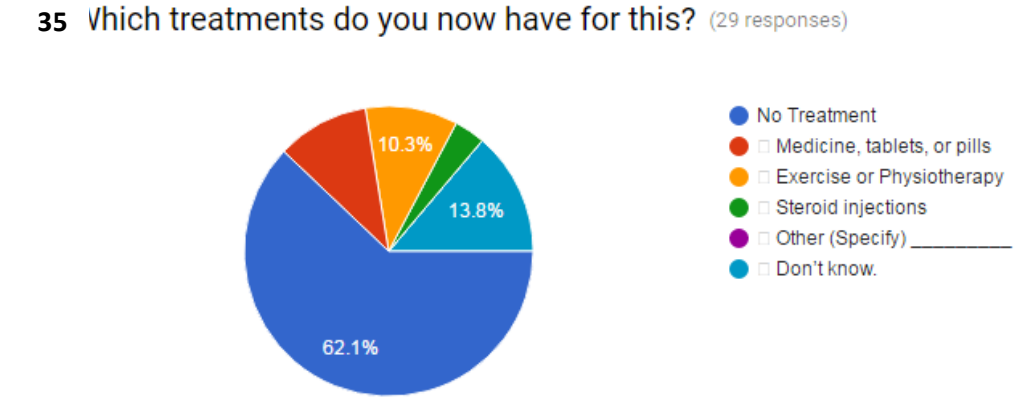
32. Have you ever been told by a doctor you have osteoporosis, thin or thinning bones?
(41 responses)

33. Was this following a fracture? (31 responses)

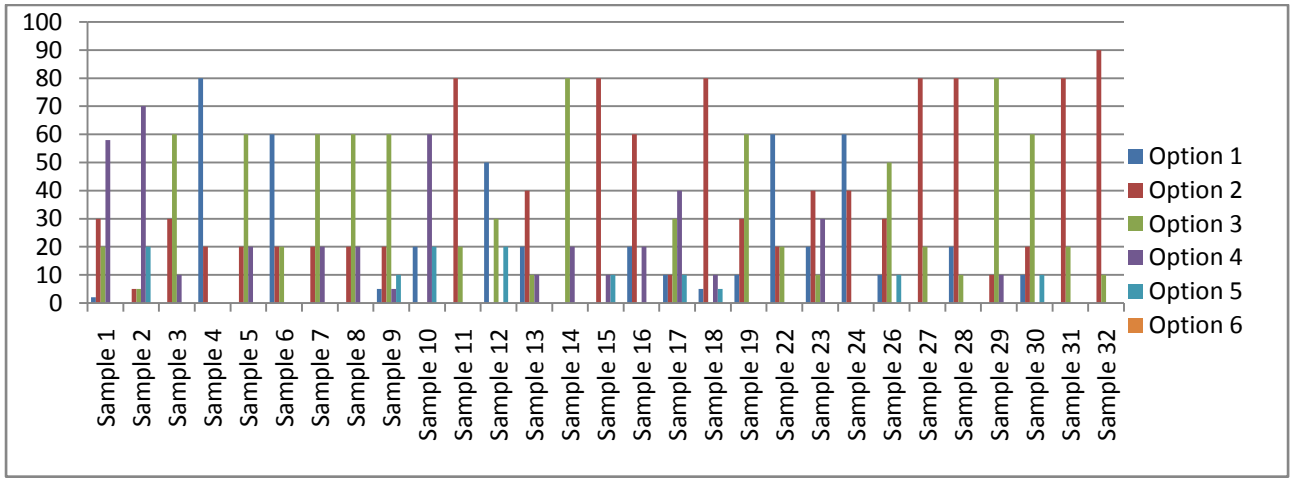


34. How old you were, when this was first diagnosed? (16 responses)

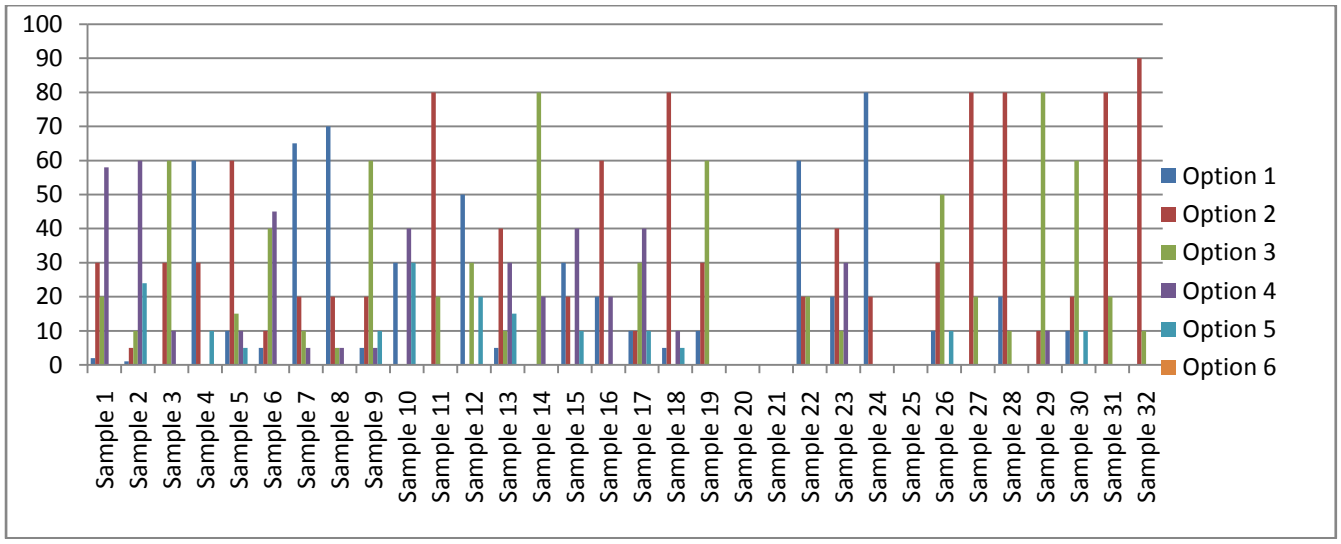




Offline survey (39 members)



Questionnaire sample Vs Percentage of options selected for Male Response (18).



Questionnaire sample Vs Percentage of options selected for Female Responses (21)

CONCLUSIONS

The number of good quality studies has increased during this period compared with the number found in reviews conducted in previous decades. The number of studies, however, is still not very large and many reports do not describe or quantify how well the risk factors were reduced at the workplaces concerned.
It is possible to draw the following conclusions about the different types of interventions based on the randomized and non-randomized comparative studies in the workplace, trials without a comparison group, and laboratory studies.

Organizational and administrative interventions
There are few studies on these interventions. There is limited scientific evidence that a reduction in daily working hours from more than seven hours to six hours can reduce neck and shoulder disorders in physically demanding health care work. There is also evidence that it is possible to introduce additional breaks into repetitive work without loss of productivity. It is not known how the breaks should be organized in order to prevent the occurrence of MSDs most effectively, there is strong scientific evidence that technical measures can reduce the workload on the back any loss in productivity. There is moderate evidence that these measures can also reduce low back disorders and sickness absenteeism. There is strong evidence from laboratory studies that ergonomic hand tools can reduce the load on the upper extremities. There is also limited evidence that such measures can also reduce the MSDs associated with vibration or the manual tasks performed in computer work.
The evidence of the effectiveness of back belts in the prevention of low back pain is conflicting. There is no conclusive evidence to support back belt use as a preventive measure for workers carrying out manual material handling. No evidence has been found to decide if other protective equipment such as splinting of the wrist is effective in preventing upper limb disorders.

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