SCIENTOMETRICS: A NEED FOR PHYSICAL THERAPY

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Dear Sir,

Due to the emergence of electronic media into science and technology, the awareness and acquaintance to scientific data has been increased during the past three decades. Internet facilities have made possible the reach of data to all the academicians/researchers. Mushrooming of publications and duplication of articles has been tremendously increased in the recent years. Due to the emergence of new science called scientometrics, the quality and quantity of scientific material is expected to be measured and analyzed on the basis of scientific measures.

This modern technology measures not only the published material also the evaluation of scientists (H-index) and their role in particular field along with the ranking of field experts and expertise. These measures and analysis not only determines the impact of scientific work but also the upcoming researchers to choose particular field experts for their ongoing work to yield authenticated outcomes and validation of research performance.

Scientometrics basically focuses on assessment and evaluation of scientific rigor and emphasize the relative growth and scientific priority in many fields.

The modern Scientometrics also means to explain the quality of work based on bibliometric analysis of scientific publications and citations.

In brief Scientometrics is the study of measuring and analysis of science and its innovations

Key Words: Scientometrics, Physical therapy, Effect size

ROLE OF SCIENTOMETRICS IN THE FIELD OF PHYSICAL THERAPY

So far Scientometrics have been playing a role to measure various disciplines and their extended levels of educational performance.

One recent study has concluded that citation analysis through Scientometrics does not mean the scientific merit of the research work done.

The work of numerous research articles mostly reveals the probability of the observed difference between the samples in terms of P value. But the future research analysis would also be based on the amount of difference between the samples, the statistical ‘Effect Size’ analysis do explains not only the significant difference but also the concept of amount of difference between the samples.

Since physiotherapy involves different methods of treatment interventions, only P-value variability may not serve the purpose of observed/ significant difference to be applicable on patient population but also needs the amount of difference whether it is a large or small treatment ‘effect size’ of interventions between the samples observed.

Hence, the scientific measure of ‘effect size’ analysis would bring the citation weightage to scientific merit of the research work done thereby increases the ‘impact factor’ of the journals.

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IPSYCHOMETRIC EVALUATION OF KNEEPAIN: ABAB DESIGN
A Single Subject Randomized Control Trial

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ABSTRACT

Aim: The purpose of this study was to evaluate the efficacy of psychometric tools and physiotherapeutic interventions on pain perception in knee osteoarthritis patient.

Case Study: A 58-year-old male patient with bilateral grade-2 primary knee was referred to a physiotherapist with a complaint of bilateral knee pain. He experienced pain severity of nine on visual analog scale, difficulty climbing stairs and while walking. Pain was also assessed using self-rated psychometric tool such as Knee pain and osteoarthritis outcome score (KOOS). The pain subscale was 12% means severe pain prior to the intervention using KOOS questionnaire. The patient was given bilateral multiple angled resisted exercises twice daily for 3 weeks.

At the end of 6th week pain was nearly normal twoon visual analog scale and Knee pain and osteoarthritis outcome score pain subscale was 90% means substantial pain relief and good improvement in gait.

Discussion: Psychometric tools are the most reliable and validated tools in the evaluation pain perception in bilateral knee osteoarthritis as the pain perception differs during various activities of daily life.

Conclusion: This case concludes that resisted exercises were effective and these scales are diagnostic as well prognostic in use for longitudinal prospective interventional studies due to their validity and reliability.

Key Words: Resisted exercises, Knee pain, Visual analog scale, Pain subscale of KOOS

INTRODUCTION

Pain is the most excruciating and occurring symptom in people with knee osteoarthritis leading to worsening of the activities of daily living. Many patients with bilateral or unilateral knee pain may appreciate various degree of pain perception during their physical activities of daily living. Among available interventions, resisted exercises were also beneficial in the management of Osteoarthritis knee. Visual analog scale which is most reliable subjective method used to provide pain perception at rest in knee osteoarthritis patients. Patients may not be able to differentiate pain threshold at various physical activities but the recent development of psychometric tools are most useful tools which assesses the pain levels during activities of daily living. Hence, this single subject control trial was done to evaluate the effects of resisted exercises and efficacy of psychometric tool as subjective and specific assessment tools.

A SINGLE SUBJECT RANDOMIZED CONTROL TRIAL

Patient history

The patient, a 58-year-old male complained of bilateral knee pain for 5 months that had started gradually. There was no history of trauma, congenital or acquired knee deformities, ankylosing spondylitis. The cardinal symptoms were knee pain, with restricted knee painful movements. He had no history of a similar problem in the past. The symptoms worsened as the day progressed and relieved with rest.

Physical examination

On examination, it was found that the patient had decreased knee movements, inability to flex full range of flexion. Restriction of active extension and flexion were measured using a universal goniometer, where flexion was more restricted than extension, measuring 110° flexion, left and right knee

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flexion was 110° each side. He rated his pain threshold level as 9 on a 0-10 linear visual analog scale (VAS). There are 9 psychometric questions of pain domain of KOOS scale. In the present study, active movements were measured by universal goniometer method in knee pain. The patient was then educated about his condition and the possible treatment to be given.

**EXERCISE THERAPEUTICS**

**Strengthening**

Strengthening exercises for extensors and flexors of the knee were administered to maintain the muscle strength. The patient was given resisted exercise in sitting position twice a day for three alternative weeks along with initial isometrics to overcome muscle soreness and to facilitate resisted exercises. Resisted exercise was carried out using a minimal weights after determining the repetition maximum [1RM]. In the second week, there was no exercise given. In the third and fifth weeks, the weight was progressed as the patient was more comfortable to the resisted exercise twice a day, like wise on the second, fourth and sixth weeks; he was discontinued from the resisted exercise to see the efficacy of the resisted exercise on pain variable as under ABAB[A-intervention, B-no intervention, A-intervention- no intervention design]. The first, third and fifth were treatment given weeks, likewise the second, fourth and sixth weeks were control weeks.

**Clinical outcomes:**

At the end of the first week of intervention with consolidated weight, the patient was reassessed; his pain had decreased from 9/10 to 7/10; pain subscale of KOOS was 30% from 12% and ROMs of flexion had improved from 110° to 115°. At the end of the second week, without intervention the patient was reassessed; his pain status was the same like at the end of first week, 7/10 on VAS, KOOS was 30% respectively. At the end of the third week of intervention with progressed weight, the patient was reassessed; his pain had decreased from 7/10 to 4/10, KOOS was 60% from 30% and ROMs of flexion had improved from 115° to 120° and respectively. At the end of the fifth week of intervention with progressed weight, the patient was reassessed; his pain had decreased from 4/10 to 2/10, KOOS was 90% from 60% and ROMs of flexion had improved from 120° to 135° and respectively. At the end of the sixth week without intervention, the patient was reassessed, his pain status was same like at the end of the fifth week. This case study with single subject randomized control trial design clearly shows the efficacy of resisted exercise and psychometric tools in assessing pain and improving the ROM of flexion and extension.

**DISCUSSION:**

There are many linear psychometric scales available but VAS is more reliable in terms of quantification of pain as a subjective measure of specification of pain intensity and it is unidirectional measure of pain intensity. The sensitivity and reproducibility are very much acceptable. But more reliable in literate people than illiterate people and also VAS scale has limitation in measuring pain among older adults due to decline in cognitive ability and older adults with knee OA may not be able to differentiate the quantity of pain as this OA pain is mostly perceptual during physical activities. The pain subscale of KOOS scale has nine items which is constructed based on the symptoms of rheumatic diseases. This scale is highly comprehensive and multidimensional in terms of physical functioning as it helps the clinician to understand and plan the rehabilitation program.

**CONCLUSION**

In this single subject randomized control trial, resisted exercises shown to be effective and pain subscale of KOOS scale has better multidimensional pain evaluation capability than unidirectional VAS scale compared to control weeks.

**Clinical implications:**

Clinicians must select proper questionnaire that is most appropriate for their specific purpose and betterment of the patient prognosis.

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Abbreviations: KOOS - Knee and osteoarthritis outcome score, VAS:visual analog scale, ABAB :A-intervention, B-no intervention ,OA: Osteoarthritis, ROM : Range of motion, 1RM : repetition maximum

REFERENCES


Effect of age on hand grip strength in professional cricket players

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Cricket is the most popular team sport in India. Hand-grip strength (HGS) plays a vital part in all roles of cricket which may be affected by age. To find-out the effect of age on HGS in Indian professional cricket players. Study-design: Experimental study; different subject design. Sampling technique: Convenient sampling Sample size: 322 male cricket players aged between 13 and 38 years. Independent variable: Age group (13-16, 17-19, 20-25, and 26-38) Dependent variable: HGS in 3 different positions for both right and left side. Instrument used: Jamar hand-held electronic hand-grip dynamometer. Statistics: Mean standard deviation (SD) as descriptive and one-way ANNOVA with LSD post-hoc analysis as inferential statistics. 13-16 group showed significantly lower HGS than other three age groups. HGS increased up to 25 years without any significance. Peak HGS value was shared between 20-25 and 26-38 groups. Hand-grip strength (HGS) is significantly lower in young players (13-16 years) than adults possibly due to differences in attaining puberty by this age category which affects HGS through testosterone in blood. The possible lack of difference after 18 years may be sports training help those three groups to achieve peak testosterone level in blood which helps muscle building hence HGS.

Keywords: HGS, jamar dynamometer, age-difference, team sport, testosterone

Cricket is much more demanding and challenging skills such as fielding drills (like diving & sliding), batting techniques, bowling speed (above 140 km/hour ), throwing techniques, running between wickets, catching techniques and last but not least over-all physical fitness. These changes took place after the introduction of one day games and T20 games apart from traditional test match (5 days).

Among different tests used in cricket, there is no test for hand-grip strength (HGS) measurement during pre-participation evaluation. However, HGS plays a significant part in all roles of cricket play (i.e.) batting, fielding and bowling and has positive correlation with shoulder power (Sathya et al., 2016). The traditional way of HGS measurement was in sitting position with subject's shoulder in 0° flexion, adduction (neutral); elbow in 90° flexion, forearm in mid-prone position (neutral); wrist in slight extension (neutral) and all fingers in flexion position. But cricket game demand HGS in different shoulder, elbow, forearm positions which should be in standing rather than traditional position.

Method

Participants

Present study was an experimental study with different subject design based on cross sectional survey. 322 Indian male cricket players were recruited through convenient sampling technique after screening following inclusion and exclusion criteria: Inclusion criteria: Professional male cricket players who practices minimum 4 days week and plays regular matches for their clubs, districts, sates and national level for the period of at least 2 years. Age should be between 13 to 38 years. Exclusion criteria: Professional players who is suffering from any acute or chronic upper limb injuries. Selected candidates were given informed written consent to participate in the present study. Selected 322 players, had following characteristics: age, height, weight, BMI was 19.83 ± 4.71 years, 172.17 ± 7.03 cms , 67.53 ± 9.69 Kg and Kg.m-2 respectively (values are in mean± SD). They were divided into four groups based on age: 13-16 yrs (82 players), 17-19 yrs (121 players), 20-25 yrs (73 players) and 26-35 yrs (46 players). Maximal hand-grip strength (HGS) was measured in three
Prevalence of knee pain and its correlates with specific emphasis on CVD risk factors in Hisar urban population

Background: Literature shows osteoarthritis increases the cardiovascular disease related death. There are no such studies from Indian subcontinent that shows association between cardiovascular disease (CVD) risk factors and knee pain. Thus the aim of this study was to see the association between selected CVD risk factors and knee pain in urban Hisar population. Methods: Present study was a cross-sectional survey in which 1503 subjects (response rate 72.2%; female 54.2%) aged 30 years or more were randomly selected through multi-stage random technique. Data was collected through standardized questionnaire and published measurements techniques by two physiotherapists in summer 2016. Knee pain was defined as pain around knee joint that required meeting physician or physiotherapists or activity modification for at least 3 days in the last 12 months. Following variables were selected as CVD risk factors: age, sex, body mass index (BMI), waist circumference (WC), smoking habit, alcohol consumption, blood pressure (BP), fasting blood glucose (FBG). Standard cut-off values were used to define general obesity, abdominal obesity, hypertension, diabetes from BMI, WC, BP, FBG values respectively. Data was analysed using chi-square test and binary logistic regression technique. Results were presented as OR with 95% CI. All analysis were done using IBM-SPSS (21.0 version) software. Findings: Old age, female sex (OR 1.86; 95% CI 1.44-2.40), general obesity (1.94; 1.39-2.72), abdominal obesity (1.97; 1.42-2.75), non-smoking (1.48; 0.94-2.33), non-alcohol consumption (1.95; 1.17-3.26), hypertension (1.51; 1.18-1.94), diabetes (2.51; 1.83-3.45) were identified as risk factors for knee pain. After adjustment old age (1.06; 1.04-1.07), female sex (2.23; 1.69-2.96), general obesity (1.47; 1.01-2.13) and diabetes (1.65; 1.17-2.33) were identified correlates for knee pain in this urban population. Limitation: Results of this study are compared with osteoarthritis studies. Conclusion: There is conflicting (some positive and some negative) association between CVD risk factors and knee pain. Controlling weight, BP, FBG would reduce the knee pain.

Keywords: pain • prevalence • risk factors • CVD • diabetes • hypertension • osteoarthritis
with OA and well documented in literature [13-15]. Literature are showing conflicting results between CVD risk factors (especially metabolic syndrome components) on OA knee depending on country in which the study was carried out [16-22].

Most of the current literature based on large population is mainly from developed countries and other Asian countries making difficult to understand the risk in India. Recent article from India based on large sample size reported the knee OA prevalence at 28.7%. But they did not report the odd ratio for different identified CVD risk factors [23].

The objectives of the present paper are to find out over-all, age specific, gender specific prevalence of knee pain in urban population of Haryana; to see the association between selected CVD risk factors and knee pain.

**Methodology**

Present study was a population based cross-sectional study conducted on urban geographical location (Hisar city, Haryana state, India-country). Selection sample, sampling technique were already published in our baseline data paper [24] with following modifications. Only five locations sample data has used- one location data was not available. Overall response rate was 72.20% (1540 out of 2133 invited subjects were agreed to participate). After removal of 37 subjects during validation phase, data of 1503 subjects (female 814-54.2%) were used in this paper. The mean ± SD of age, height, weight, BMI of selected sample were 48.23 ± 13.12 years, 161.68 ± 8.46 cm, 67.96 ± 12.42 Kg, 25.97 ± 4.57 Kg m⁻² respectively.

Detailed data collection methods have been already published else ware [24], Briefly, pre-designed questionnaire (in English), modified from pilot study done in 2015, and was administered to collect data. Following parameters, relevant to our objectives of this paper, were self-reported: age, height, weight, smoking, alcohol habits. The following parameters was measured and recorded in the questionnaire: BMI, Waist Circumference (WC), Blood Pressure (BP), and Fasting Blood Glucose (FBG).

Knee pain was defined as pain around knee joint that required meeting medical personnel (physician, physiotherapist) or pain that prevented from carrying normal ADL for at least 3 days in the past 12 months. Modified Nordic musculoskeletal questionnaire (only middle 2 sections) with diagram used by de Barros and Alexandre [25], was used for this purpose.

BP was measured three times using automatic digital sphygmomanometer [OMRON®, Binh Duong, Vietnam] in sitting position. SBP 130 mmHg or more and DBP 85 mmHg or more along with uncontrolled self-reported hypertension were classified as hypertension. FBG was measured by hand-held portable glucometer [ACCU-CHECK Active, Mannheim, Germany]. FBG greater than 100 mg dL⁻¹ but less than 125 mg dL⁻¹ was classified as pre-diabetes. FBG greater than 125 mg dL⁻¹ or self-reported diabetes were classified as diabetes. WC was measured using non-elastic inch at mid-way between 12th rib and anterior superior iliac spine. Measurement was recorded in the assessment form, questionnaire, to the nearest centimeter (cm) value. WC greater than 80-89 cm for females; 90-99 cm for males were classified as Asia specific abdominal obesity and 90 cm or more for females; 100 cm or more for males classified as abdominal obesity.

BMI was calculated from self-reported values of weight in kilogram and height in meters. The formula used was weight divided by height [2]. BMI <25 Kg m⁻², 25-29.99 Kg m⁻², 30 Kg m⁻² or more were classified as normal, overweight and general obesity respectively.

Over-all, sex and age stratified prevalence of knee pain was calculated in percentage. Chi-square test using cross-tabulation was used to see the association between variables and knee pain. If there was a significance in chi-square test variables were entered in to binary logitic regression individually as well as combination and enter method model was used for the presentation. All the analysis were done in IBM-SPSS (version 21.0).

**Results**

Table 1 shows prevalence rate according to selected variables along with missing values. One year prevalence of knee pain was 21.6%. Females (26.3%) were more complained than males (16.1%). It increased as age, BMI, WC increases. Smoking and alcohol consumption decreased the knee pain prevalence.

Table 2 shows association between 8 selected variables and one year knee pain in urban population using chi-square test ($x^2$). Age,
Prevalence of knee pain and its correlates with specific emphasis on CVD risk factors

Research Article

Prevalence of knee pain doubled in 40-49 years group; tripled in 50-59 years group and more than 7 times in 60 year or more group as compared to 30-39 years group. Females were 86% more risk for knee pain than male counterpart. General obesity and abdominal obesity doubled the risk of experiencing knee pain in one year. Smoking sex, WC, FBG (4 variables) were very highly associated with knee pain with significant p<0.001. BMI, hypertension (2 variables) were the next significant variables associated with knee pain (p=0.001). Alcohol consumption also associated with knee pain (p=0.009). Smoking was not associated with knee pain (p=0.092).
and alcohol consumption prevented knee pain prevalence in this population. Non-smokers were 50% and non-drinkers were 100% more risk for knee pain. Individual with hypertension and diabetes were 50% and 150% more risk of experiencing knee pain.

Table 3 shows adjusted OR along with 95% CI when all 6/5 variables entered into binary logistic regression (multivariate). Enter method with constant was used for presentation. Age, sex, diabetes were significant and BMI was significant when WC was removed from the model. Being female more than doubled the risk of experiencing knee pain. Diabetes increased the knee pain prevalence by 50-65%. When age was entered as continuous variable instead of categorical in multivariate binary logistic regression along with other 5 categorical variables, OR (95% CI) for age was 1.055 (1.044-1.067).

**Discussion**

Overall one year self-reported knee pain prevalence is 21.6% in Hisar urban population. Old age, female sex, high BMI, high waist circumference, not smoking, not drinking alcohol, high blood pressure, high FBG are the possible risk factors for knee pain. After adjustment old age, female sex, and high FBG remained the correlates for knee pain in this population.

High FBG increase the knee pain risk by 50% (adjusted OR 1.53 for prediabetes and 1.65 for diabetes). Recent meta-analysis based on 49 studies, of which 28 were cross-sectional studies, concluded that there is an association between diabetes and osteoarthritis (OR 1.51) [16]. Similar to majority of the studies, our result also shows this association is significant even after adjustment of BMI. However, there is no study from India that shows this relation. Diabetes has shown as risk factor for joint space narrowing-disease progression, in knee osteoarthritis [18]. Molecular mechanisms for OA in diabetes are given elsewhere [26], briefly, cartilage stiffness and permeability changes; biochemical changes in tendon; bone healing after micro fractures that are associated with diabetes among others [26].

Both overweight (OR 1.27; 95% CI 0.96-1.67) and obesity (OR 1.94; 95% CI 1.39-2.72) based on BMI increase the knee pain prevalence. However, this risk reduced to 1.47 (1.01-2.13) when the values are adjusted for age, sex, blood pressure, FBG values. This is supported by both Indian [23,27] as well as Asian/western studies [7-9,14,15,28,29]. The mechanism for knee pain in obese people is excessive load on weight-bearing joints due to excessive weight.

Abdominal obesity based on WC doubled the risk (OR 1.97; 95% CI 1.42-2.75) of one year knee pain prevalence. However, this was reduced to insignificant (OR 1.14; 0.78-1.67) when the values were adjusted to age, sex, blood pressure and FBG level. There is no consensus on the association of central obesity and knee OA as some shows significant relation [19,21] on the other hand some shows relation is depends on gender [20,30].

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variables</th>
<th>Sub-category</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>30-39</td>
<td>1.84 (1.19-2.85)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40-49</td>
<td>2.62 (1.70-4.03)</td>
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<tr>
<td></td>
<td></td>
<td>50-59</td>
<td>6.64 (4.41-9.98)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 or more</td>
<td>Reference</td>
</tr>
<tr>
<td>2</td>
<td>Sex</td>
<td>Males</td>
<td>2.23 (1.69-2.96)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>Reference</td>
</tr>
<tr>
<td>3</td>
<td>BMI</td>
<td>Normal</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General obesity</td>
<td>1.47 (1.01-2.13)</td>
</tr>
<tr>
<td>4</td>
<td>WC</td>
<td>Normal</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abdominal obesity</td>
<td>1.14 (0.78-1.67)</td>
</tr>
<tr>
<td>5</td>
<td>BP</td>
<td>No</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>1.20 (0.91-1.59)</td>
</tr>
<tr>
<td>6</td>
<td>FBG</td>
<td>Normal</td>
<td>Reference</td>
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<td>Prediabetes</td>
<td>1.53 (1.11-2.11)</td>
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<tr>
<td></td>
<td></td>
<td>Diabetes</td>
<td>1.65 (1.17-2.33)</td>
</tr>
</tbody>
</table>

BMI: Body Mass Index; WC: Waist Circumference; BP: Blood Pressure; FBG: Fasting Blood Glucose

*Denotes other variable removed from model i.e., BMI was without WC; vice-versa. Values were adjusted for other 5/4 variables
Hypertension increases (OR 1.51; 95% CI 1.18-1.94) the risk of knee pain prevalence in this population. But OR reduced to 1.20 (95% CI 0.91-1.59) when the values were adjusted for age, sex, BMI, FBG. Similar finding was observed in three Asian studies [19,29,31]. Morovic-Vergles et al. [17] concluded that the association between OA and hypertension is explained by age and BMI which is similar to our finding. However, hypertension may affect the OA disease severity by arterial stiffness [32] and bone loss [33].

Both smoking and alcohol consumption shows protective effect on knee pain. This finding is new to India as there are no supporting findings from India. But several studies from outside India shows smoking act as protective role in knee pain [14,15]. Two Asian studies [29,31] found drinking act as protective role in knee pain. The exact mechanisms for these findings are not available and future studies should focus on this topic.

Age advancement increase the knee pain (adjusted OR 1.06; 95% 1.04-1.07). This means 6% rise in knee pain per year age raise starting from 30 years (risk is not linear). Similar risk has observed in Koreans [28] and rural Chinese [34]. Old age the risk factor for knee pain/ OA is supported by several studies from India [23,27,35] and western literature [14,15].

Being female sex doubled the risk (adjusted OR 2.23; 95% CI 1.69-2.96) of knee pain. This is supported by both Indian [23,35] and Asian/ western studies [1,7-9,14,15,28,29,31]. The possible mechanisms may be wider pelvis in females that results changes in femur and tibia alignment (deformity).

It is well known that age, sex, BMI are associated with knee pain. New findings emerged from this study are protective role of smoking and alcohol consumption as well as knee pain risk associated with hypertension and diabetes. These new findings are observed in other Asian/Western studies not from India.

Main limitation of this paper is that even though we have measured self-reported knee pain, we used knee OA studies (both cross-sectional and cohort) in the discussion to support our results. The rationale for this have been given in introduction i.e., OA is the most common condition that represents knee pain in middle and old age [7-9]. We have not classified the knee pain into acute or chronic which may be more reliable for OA than simple knee pain, but we don’t have the data to do this as the data was collected in early 2016. We assumed that OA is the cause of knee pain in our middle and old aged population hence we used OA literature.

The strength of this paper is that there is no study from India that focus the association between CVD risk factors and OA knee so far. Large sample studies on rheumatological conditions from India are rare. This study results will help to see the future trends in CVD risk factors and their association on knee pain.

CVD risk factors are having positive i.e., age, general and abdominal obesity, hypertension, diabetes as well as negative i.e., sex, smoking, and alcohol consumption association with knee pain. Majority of CVD are not significantly associated with knee pain after adjustment. Old age, female sex, BMI and diabetes are significant correlates for knee pain in this urban population aged 30 years or more.

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References

Cross-Cultural Validation of Urdu Version KOOS in Indian Population with Primary Knee Osteoarthritis

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Purpose. The primary aim of this study was to translate a self-reported questionnaire (KOOS) from English to Urdu and then to see its internal consistency, agreement, test-retest reliability, and validity among primary OA knee patients. Methodology. First, KOOS questionnaire was translated from English language to Urdu through standardized cross-cultural protocol. This translated version of KOOS was administered to 111 radiographically diagnosed primary OA knee patients at two times with 48-hour interval in-between. Cronbach’s alpha, floor and ceiling effect, intraclass correlation coefficient (ICC), absolute agreement %, and Spearman correlation were used to fulfill our objectives.

Results. Average time to administer this questionnaire was 20 minutes. There was good internal consistency with Cronbach’s alpha ranging from 0.7246 to 0.9139. The absolute agreement of each item between two tests ranged from 81.08% to 98.20%. Test-retest reliability was excellent (“r” ranged from 0.9673 to 0.9782). There was no ceiling effect; however less than 4% floor effect was seen in two subscales. There was significant difference that existed between different X-ray grades in all subscales meaning good content validity for disease prognosis. Conclusion. The present results show that KOOS Urdu version is a reliable and valid measure for primary OA knee patients.

1. Introduction

Urdu is spoken by more than 65 million people in the world who are predominantly from two Asian countries, that is, India and Pakistan. It is a national language of Pakistan and one of 22 languages recognized by Indian constitution. It is historically associated with Muslims of north Indian subcontinent [1].

OA knee is one of the most common musculoskeletal problems in middle and old aged population. The prevalence of knee OA in Indians aged 30 years or more is approximately 20% [2]. Physicians and paramedical staff use various methods/tests for diagnosis and prognosis of knee OA and to see effectiveness of interventions, that is, life-style modification that includes exercise, medicine, and surgery. The tests used in knee OA are broadly classified into subjective, that is, health related quality of life (HRQOL) questionnaires, and objective, that is, 6-minute walk test [3] categories.

Knee osteoarthritis outcome score (KOOS) is one of the disease specific questionnaires that has been widely used in literature. It has been translated into 49 languages worldwide so far. Originally developed in Swedish and for young athletes with knee injury, KOOS is a self-reported questionnaire that contains 42 questions in 05 broad domains, that is, symptoms including stiffness, pain, activities of daily living (ADL), sports-recreation, and quality of life (QOL). Each question contains 5-point Likert scale with “0” being lowest and “4” being highest. Each domain calculated by percentile with “0” means no problem and “100” means maximum problem.

English reading and understanding in India are very low which warrants the translation of self-reported questionnaires to regional languages. KOOS has been successfully translated into 8 Indian languages so far without any scientific publications on its validation in Indian population. Thus the objective of this paper is to translate the KOOS in Urdu language using cross-cultural adaptation followed by measuring internal consistency, test-retest reliability, percentage of agreement, floor–ceiling effect, content validity, and construct/criterion validity of translated version.
2. Methodology

The whole protocol was divided into two stages: cross-cultural adaptation and content validation. In first stage, the English version of the KOOS questionnaire was translated into Urdu version through standardized procedure recommended by Beaton et al. [4] with some modification. We translated and culturally adapted the KOOS according to Indian living standards to adapt/fit and use in Indian Urdu speaking Muslim Osteoarthritis population for the evaluation of self-rated knee functional status. In brief, stage I was done by the first author with the help of online translation portal. We skipped stages II and III recommended by Beaton et al. [4]. In stage IV, 10 Muslim experts (02 orthopaedicians, 02 rheumatologists, 02 English professors, 02 Urdu professors, and 02 religious priests) were volunteered for the review of questionnaire developed in stage I. The experts discussed and finalized that questions in sports and recreation should be supplemented by cultural activities; hence S1 should be “squatting” instead of “floor eating, using Indian toilet (comode)” instead of “squatting” and S5 should be “kneeling” instead of “kneeling.” Overall, Urdu professors and religious priests simplified the language, whereas medical experts helped with the medical terminology used in the questionnaire. In stage V, questionnaire developed at the end of stage IV was administered to 20 Urdu speaking OA knee patients. All patients understood the questions and responded correctly; hence there was no modification of questionnaire at this stage.

In stage two, we evaluated the clinometric properties and validity of translated Urdu version of KOOS on primary OA knee patients. The subjects were all consecutive outpatients consulting for knee OA in two orthopaedic hospitals. The inclusion criteria were patient age of at least 40 to 75 years and primary knee OA according to the American College of Rheumatology (ACR) criteria [5], again confirmed by radiograph, and patients should be able to understand and complete the self-report questionnaires. The exclusion criteria were the presence of other significant rheumatic disease variants, low back pain, severe inflammatory arthritis as confirmed by physical examination, and intra-articular use of corticosteroids within the previous 3-month history.

A total of 119 patients (47 males and 72 females) were asked to complete the KOOS questionnaire in Urdu at outpatient department (OPD) and instructed to come two days later to fill it once again (111 patients returned [93.28% compliance rate]: 47 males and 64 females). We requested orthopaedic physicians to give minimal dose of analgesics for two days to prevent medicine effect on pain, symptoms, and ADL subscales. We decided 2-day gap as this is minimal requirement to avoid recall of answers by patients [6].

Item analysis was done using interitem correlation in which consistent values of <0.3 or >0.7 should be considered for removal of that item (question) as this indicates item irrelevance to the group (subscale) [7]. Internal consistency of individual subscales was measured using Cronbach’s alpha (with less than 0.7, removal should be considered [6, 7]), two-day test-retest reliability using ICC [6, 7], percentage of agreement as absolute and >1 point variation between 1st and 2nd time [8], and floor- [lowest 0%] ceiling [highest 100%] effect of individual subscales using percentage [8]; content validity was measured by comparing degree of disease severity assessed by X-ray using one-way ANNOVA [8]; and construct/criterion validity of pain subscale was compared with VAS using Spearman (rho) correlation [6, 9].

All analysis was done in IBM-SPSS (version 21.0) software.

3. Results

Table 1 shows that the mean KOOS ranged from 34.15 to 51.42. There was no ceiling (100%) effect; however 2 and 4 persons have lowest (0%) score in sports and recreation and quality of life (QOL) subscales, respectively.

Table 2 shows internal consistency and test-retest reliability of Urdu KOOS questionnaire in primary knee OA patients. Cronbach’s alpha (CA) ranged from 0.725 for QOL subscale (95% CI 0.634–0.798) to 0.914 for ADL subscale (95% CI 0.889–0.935). Since all subscale CA is greater than 0.7, there is no need of removal of subscale from the questionnaire. Two-day test-retest reliability of Urdu KOOS questionnaire ranged from 0.967 for symptom subscale (95% CI 0.952–0.977) to 0.986 for ADL subscale (95% CI 0.979–0.990). This table confirms that there is excellent short term test-retest reliability for KOOS questionnaire Urdu version.

Table 3 shows the descriptive statistics along with one-way ANNOVA for five subscales of Urdu version of KOOS in radiographic OA knee patients (n = 119).

Table 1: Descriptive values for KOOS subscales in radiographic OA knee patients (n = 119).

<table>
<thead>
<tr>
<th>Subscale name</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOOS-pain</td>
<td>44.68 ± 16.64</td>
<td>14–83</td>
</tr>
<tr>
<td>KOOS-symptom</td>
<td>51.42 ± 15.91</td>
<td>11–96</td>
</tr>
<tr>
<td>KOOS-ADL</td>
<td>48.61 ± 14.02</td>
<td>18–94</td>
</tr>
<tr>
<td>KOOS-sports/rec</td>
<td>35.34 ± 15.41</td>
<td>0–75</td>
</tr>
<tr>
<td>KOOS-QOL</td>
<td>34.15 ± 18.44</td>
<td>0–69</td>
</tr>
</tbody>
</table>

Table 2 shows internal consistency and test-retest reliability of Urdu KOOS questionnaire in primary knee OA patients. Cronbach’s alpha (CA) ranged from 0.725 for QOL subscale (95% CI 0.634–0.798) to 0.914 for ADL subscale (95% CI 0.889–0.935). Since all subscale CA is greater than 0.7, there is no need of removal of subscale from the questionnaire. Two-day test-retest reliability of Urdu KOOS questionnaire ranged from 0.967 for symptom subscale (95% CI 0.952–0.977) to 0.986 for ADL subscale (95% CI 0.979–0.990). This table confirms that there is excellent short term test-retest reliability for KOOS questionnaire Urdu version.

Table 3 shows the descriptive statistics along with one-way ANNOVA for five subscales of Urdu version of KOOS in radiographic OA knee patients.
OA knee patients who were classified according to Kellgren-Lawrence (K/L) grades I–IV based on their X-ray. In order to see the content validity, we hypothesised that as the severity of OA knee increases, KOOS score will decrease which is confirmed in Table 3. Post hoc analysis showed that mean difference (MD) was $-11.56$ (95% CI $-1.46$ to $-21.66$, $p = 0.014$) for K/L3 compared to K/L2 and MD $-13.88$ ($-6.58$ to $-21.18$, $p < 0.001$) for K/L4 compared to K/L3 in KOOS-pain subscale. MD was $-11.09$ ($-2.43$ to $-19.76$, $p = 0.004$) for K/L4 compared to K/L3 in KOOS-symptom subscale. MD was $-11.94$ ($-1.18$ to $-22.70$, $p = 0.019$) for K/L3 compared to K/L2 in KOOS-ADL subscale. MD was $-13.02$ ($-5.48$ to $-20.57$, $p < 0.001$) for K/L4 compared to K/L3 in KOOS sports subscale. MD was $-15.56$ ($-8.74$ to $-22.38$, $p < 0.001$) for K/L3 compared to K/L2 and MD $-18.40$ ($-13.48$ to $-23.33$, $p < 0.001$) for K/L4 compared to K/L3 in KOOS-QOL subscale. There was no significant difference between subsequent other grades in all subscales, that is, between K/L1 and K/L2, K/L2 and K/L3, and K/L3 and K/L4. There was significant difference that existed between grades II and III and grades III and IV in majority of subscales meaning good content validity for disease prognosis and treatment. VAS was well correlated with KOOS-pain ($r = -0.76$) subscale meaning good construct validity.

### 4. Discussion

The present paper has reported the cross-cultural translation of Urdu version of KOOS along with its reliability and validity. We selected 11 KOOS articles in 10 different languages to compare our results with them. The languages in which KOOS has been translated are Portuguese [6], Swedish [8, 10], Dutch [9], Chinese [11], French [12], Persian [13], Japanese [14], Italian [15], Arabic [16], and Polish [17]. They used radiographically confirmed OA patients [6, 9, 12, 14] or pre/post-knee surgery patients [8–12, 17] or other knee injuries patients [13–16].

All articles reported test-retest reliability (ICC values) in their cross-cultural validation paper. The gap between test and retest varied from minimum 1 week in 6 studies [8, 11, 13–16] to 1 year [17] between the tests. The remaining 4 studies used 2–4 weeks between tests [6, 9, 10, 12]. Our test-retest reliability values (ICC 0.967–0.986) are greater than reported by literature. The possible reasons may be that the gap between the test and retest was short (only two days) and severity of OA knee was less as majority of literature used patients undergoing surgical intervention. Test-retest reliability values are affected by gap duration between the tests [14–16] and severity of the condition [9]. We choose two days between test and retest because analgesics given by physician would improve pain, function subscales of KOOS. Later responsiveness would result in improvement in KOOS subscales at 1–3 weeks rather than reliability especially grade I knee OA patients, but it would have increased the recall bias in patients.

The internal consistency of present study ranged between 0.725 and 0.914 which is similar to [6, 8, 9, 11–14] or lower than [15–17] other translated versions. We have not observed any ceiling effect, but less than 5% floor effect was observed in KOOS sports/recreation and QOL subscales. Literature reported floor effect in either sports/recreation subscale alone [6, 12, 14, 16] or in both sports/recreation and QOL subscales [8–11, 13, 15].

Our findings of agreement between the items are similar to Roos et al. [8]. Our item analysis showed P1, S7, and ADL16 as less appropriate (interitem score less than 0.3) for their respective subscale which is supported by Xie et al. [11] in Chinese version. Our findings on KOOS subscales based on radiographic grading are supported by de Groot et al. [9] who classified patients into 3 groups, that is, mild, moderate, severe.
and severe. Their [9] mild group KOOS subscales values are greater than our grade I; moderate group values are equal to our grade II and severe group values are equal to our grade III OA patients.

Strengths of this article include first Indian language paper, fairly large sample, and novel statistical treatment for validity. Limitations include weak cross-cultural translation process; KOOS results are not compared with SF-36 and did not report the responsiveness (improvement after treatment).

5. Conclusion

The present results show that KOOS Urdu version is a reliable and valid measure for primary OA knee Urdu speaking Indian patients.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

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Hisar Urban Geographical Observational Cohort Study [HUG-OCS] - Aims and Objectives, Methodology, Future Plans

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Abstract

Introduction: The importance of physical activity, fitness on CVD risk factors are well established in western cohorts. However, there are no geographical cohorts available in India.

Aims and objectives: It has formed to identify role of physical activity, fitness, yoga practice and other sedentary behaviors on the development of some CVD risk factors (i.e.) hypertension, diabetes and obesity in urban Indian population. The secondary objective is improved physical activity, fitness behavior, yoga practice and reduced sedentary behavior on the prognosis of above said risk factors once it developed.

Methodology: 1804 subjects (female 54.6%; response rate 71.9%) were selected through multi-stage random sampling technique in 6 different locations of urban Hisar city during summer 2016. Main eligibility criteria was age should be at least 30 years at the time of recruitment. Therapist assisted standard questionnaire was administered to collect baseline subjective data. Most of the outcome variables, muscular strength were measured objectively. Yoga practice; physical activity/sitting time through GPAQ are being measured now.

Future plan: Aerobic fitness through Rockport 1 mile walk test will be measured within 2 years. Subjectively measured physical activity, ADL and sedentary behaviors will be validated through pedometers. Usage of mobile phone, physiotherapists to modify the behavior of subjects and its effect on development and prognosis of CVD risk factors will be studied future.

Keywords: Cohort, Longitudinal study, Physical fitness, Chronic diseases, CVD risk factors

I. Introduction

Being physically active and fit has now shown many health benefits.[¹, ²] Physicians in western countries are now even thinking of putting exercise as fifth vital sign for health assessment.[³] It all started from a land mark article from Framingham Heart Study in 1967 that reported protective effect of physical activity on coronary heart diseases. This leads to form another cohort in 1970-Aerobic center longitudinal study (ACLS) from Cooper institute with the aim to find health outcomes associated with physical activity and cardiorespiratory fitness. Later in 1985-86 CARDIA study started with an aim of aerobic fitness at young age on CVD risk factors, diseases and mortality. These two along with several other longitudinal studies confirmed the findings of Framingham Heart Study. Recent meta-analysis shows that fitness prevent better than BMI in all-cause mortality and advise the readers to concentrate on fitness than mere physical activity and weight reduction alone.[⁴] Results are showing sedentary behaviors like sitting time, TV watching associated with greater risk of CVD risk factors, all-cause mortality independent of physical activity.[⁵-⁷] However, there are few cohorts available from India on physical activity with two known to us-one from southern India (Kerala)[⁸], one from north India (Haryana)[⁹] and few on physical fitness (hand-grip strength).[¹⁰] Epidemiological studies based on physical activity and physical fitness over CVD risk factors are too less in India. To the best of our knowledge, there is no longitudinal study from India that sees the combined physical activity, physical fitness and sedentary behaviors on CVD risk factors in urban population.

There are several unanswered questions like how much is the dose of physical activity for Indians? Indian specific practices like yoga does have productive role on CVD risk factors or not? If yes, what is the minimal dose of yoga and in which form? Indians are considered less fit as it is evident from Olympic and Asiad medal tally. So how much fitness is required by Indians to be prevented from CVD risk factors? Apart from these questions, Will all these four factors really prevent CVD risk factors in urban Indians or not? To answer these questions we decided to form a cohort with following objectives.

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II. Objectives

Immediate (1st year)- Prevalence of hypertension, diabetes, abdominal obesity, physical inactivity, musculoskeletal pain and its correlates in urban population. Long term (5-20 years)- 5 year incidence rate (after 5, 10, 15 and 20 years) of all-cause mortality, hypertension, diabetes, abdominal obesity, musculoskeletal pain and its determinants (based on exposure variables) in urban population. Role of physical activity, yoga practice, aerobic fitness, muscle strength and reduction of sedentary behavior as prognostic variables in people with hypertension, diabetes, abdominal obesity and musculoskeletal pain.

Exposure Variables (all are modifiable)

Primary- Physical activity, Yoga practice, Aerobic fitness, Muscular strength, Sedentary activities like Laptop/computer/TV watching. Sitting, Sleeping (Total 07 variables)

Secondary- Education, Income, Smoking, Alcohol consumption, Food habit, Ghee use (Total 06 variables)

Outcome Variables

Blood pressure (Hypertension), Fasting blood glucose (Diabetes), BMI (General obesity), Waist circumference (Abdominal Obesity), Musculoskeletal pain and all-cause mortality.

III. Methodology

Type of cohort

Prospective observational cohort on general population from specific geographical location (Hisar Urban Area)

Sample collection from population:

Population of this cohort was people living in urban area of Hisar city situated in Haryana state. Sample selected for this cohort was based on multi-stage random sampling technique. Sample size was calculated using online free software (OpenEpi) at 95% significant level, 80% power with ratio of 1:7 for exposed versus unexposed and OR of 2.00 which yielded 1844. We decided at least 300 samples from one location so that difference between the locations can be studied easily in future, if need arises. 6 locations had to be selected with the sample size of 308 in each location to achieve our aims and objectives. Hisar city has 20 wards and each ward was divided into 1-6 logistic locations where, student volunteers thought feasibility (near to University), response and compliance rates will be high. 6 wards were selected (Ward No 1, 5, 8, 14, 16 and 20) and one location from each ward was randomly selected by corresponding author. Student volunteers randomly selected one house and invited the master of the house to participate in this cohort. If he agrees, all members above 30 years old were included in cohort after getting initial verbal consent from each followed by administration of a questionnaire and measurement of other outcome variables. Participants also provided their mobile number along with written willingness to join the cohort at the end of questionnaire. If master of the house not agreed to participate, volunteers visited next house using left thumb rule until they reach desired sample size (i.e.) 308 from each location.

Baseline data was collected by 3 master degree student volunteers through door-to-door visit in summer 2016 which was validated telephonically by final year bachelor degree student volunteer (this reduced the sample size from 1848 to 1804; 44 subjects were removed due to high mismatched responses). Follow-up of outcome variables data collection along with physical activity and sedentary activity measurement, yoga practice is undergoing now by 2 master degree student volunteers (Response rate above 90% in one location). All student volunteers were trained and motivated/guided by corresponding author and were acknowledged at the end of this paper.

Questionnaire:

Pre-designed questionnaire (in English), modified from pilot study done in 2015, was administered to the individual participants and therapist assisted if there was a problem to read/understand. Following parameters were self-reported: age, height, weight (are being objectively measured now), occupation, community [general (OC), backward (BC) and scheduled caste (SC)], education, income, smoking, alcohol habits, food habit, ghee use, ADL activity, computer/laptop/TV watching time, sitting time, sleeping time, self-reported hypertension, family history of hypertension, self-reported diabetes, family history of diabetes.
Measurement of Outcome variables:

Musculoskeletal pain was defined as pain that required meeting physician or pain that prevented from carrying normal ADL for at least 3 days in the past 12 months. Modified Nordic musculoskeletal questionnaire (only middle 2 sections) with diagram used by de Barros and Alexandre, was used for this purpose and was recorded for major joints (i.e) neck, shoulder, elbow, wrist, low back, hip, knee and ankle joints. All outcome variables except musculoskeletal pain were measured in early morning (6-9.30 AM) after overnight fasting (6-8 hours rest after dinner) in a manner described below.

Blood pressure was measured using automatic digital sphygmomanometer [OMRON®, Binh Duong, Vietnam] which is operated by batteries. Subject was asked to sit without support in relaxed manner while keeping hands in knees, elbow in extension and forearm supination. Cuff was fit into the left arm, while the tube connected to the instrument kept above the brachial artery. Apparatus always kept at heart level and the body of apparatus has ‘start’ button which has to be pressed before reading. This results automatic inflation of cuff to the level above the SBP, then deflated; at the end it shows SBP, DBP, pulse rate (HR) values. The same procedure was repeated thrice and the middle value was recorded with both higher and lower values removed.

Fasting blood glucose was measured by hand-held portable glucometer [ACCU-CHECK Active, Mannheim, Germany]. After sterilizing the subject’s ring finger using spirit swab, it was pricked using sterile softcilix lancets. Initial oozing blood was wiped out, and then one drop blood was taken by sensor side of glucometer strips. After approximately 5 seconds, display section shows blood glucose level in mg.dL⁻¹. The whole procedure was repeated if only extreme values comes (<60 mg.dL⁻¹ or >200 mg.dL⁻¹ without self-reported diabetes) and higher reading in lower values, lower readings in higher values were recorded.

Waist circumference was measured using non-elastic inch tape in early morning after bladder and bowel emptying. Subject was asked to stand with minimal and loose clothing. Measurement site was decided by mid-way between 12th rib and ASIS (anterior superior iliac spine). Measurement was recorded in the assessment form, questionnaire, to the nearest centimeter (cm) value. BMI was calculated from self-reported values of weight in Kilogram and height in meters. The formula used was weight divided by height².

Measurement of Primary exposure variables:

Self-reported physical activity is being measured using global physical activity questionnaire (GPAQ) as this is easy to administer and has been validated in India. Physical inactivity will be termed if the subject is not meeting 600 MET minutes per week criteria.

Yoga practice is being measured using questionnaire. Questions included were whether subject practice yoga or not (no, yes/occasional, yes/regular), if yes frequency (per week or month), duration (hours per week) and type [asana (posture flow), pranayama (breathing exercise), meditation (concentration, chanting) and kiriyas (cleansing technique)].

Aerobic fitness will be measured using submaximal Rockport 1-mile walk test as it is easy to administer with less complications when medical personnel are not present during test. The test will be administered in treadmill where speed will be self-selected by subjects. Subject will not be allowed to touch hand-rail or allowed to touch rail to maintain balance. Time taken to complete the test (in hundredth of minute), heart rate at the end of test will be measured to calculate VO₂ max using standard formula. Strength of this test is since heart rate is used in VO₂ max calculation, speed of subject walking will not affect aerobic fitness (i.e) faster walking will increase heart rate vice-versa, fitter person will have less heart rate in given walking speed. Disadvantage of this test is administration of cardiovascular drugs will affect the heart rate hence VO₂ calculation.

Hand-grip strength (HGS) was measured using Jamar digital hand-held hydrolic hand dynamometer [Base Line Evaluation set, Fabrication Enterprises Inc, NY]. HGS measurement was measured in sitting position for both right and left side. Each subject was asked to maintain the desired upper limb position (shoulder adducted, 0° flexion; elbow in 90° flexion; forearm mid-pronation), which was physically demonstrated by the therapist, and asked to press as hard as possible for 5 seconds (command given was press...one...two...three...four...five...relax). The procedure was repeated three times in right and left hand. One minute rest was given between trials. Average of three was recorded in the assessment form as Kg.

Household ADL activity was measured by questionnaire. Household activities include cooking, washing clothes, cleaning floor, roof, vehicle and utensils etc, gardening, preparing children and elders, walking/cycling for getting water, vegetables, groceries, milk etc. Questions asked for both week days and week end. Value was recorded in hours spend on household ADL activities per week.
Table 1: Baseline values of different variables in all six locations for comparison

<table>
<thead>
<tr>
<th>S.N</th>
<th>Variable</th>
<th>Location 1</th>
<th>Location 2</th>
<th>Location 3</th>
<th>Location 4</th>
<th>Location 5</th>
<th>Location 6</th>
<th>'F' value</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Sample Size</td>
<td>301</td>
<td>300</td>
<td>288</td>
<td>298</td>
<td>304</td>
<td>303</td>
<td></td>
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<tr>
<td>2</td>
<td>Response rate (%)</td>
<td>80.21</td>
<td>70.64</td>
<td>65.25</td>
<td>85.79</td>
<td>75.86</td>
<td>60.16</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Age (years) (Mean±SD)</td>
<td>45.33±12.33</td>
<td>46.86±11.90</td>
<td>49.97±12.89</td>
<td>46.73±12.71</td>
<td>48.53±13.85</td>
<td>50.70±15.08</td>
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<tr>
<td>4</td>
<td>Sex</td>
<td>55.8</td>
<td>57.0</td>
<td>50.0</td>
<td>59.7</td>
<td>52.3</td>
<td>52.8</td>
<td>0.178</td>
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<tr>
<td>5</td>
<td>Community (BC:SC in %)</td>
<td>71.1</td>
<td>50.3</td>
<td>14.4</td>
<td>59.8</td>
<td>10.5</td>
<td>6.3</td>
<td>0.000</td>
</tr>
<tr>
<td>6</td>
<td>Literacy (%)</td>
<td>25.3</td>
<td>4.0</td>
<td>2.0</td>
<td>15.8</td>
<td>5.3</td>
<td>4.0</td>
<td>0.001</td>
</tr>
<tr>
<td>7</td>
<td>Smoking (%)</td>
<td>16.9</td>
<td>8.7</td>
<td>8.1</td>
<td>10.1</td>
<td>9.5</td>
<td>4.6</td>
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<tr>
<td>8</td>
<td>Alcohol consumption (%)</td>
<td>11.0</td>
<td>14.7</td>
<td>7.0</td>
<td>12.0</td>
<td>8.8</td>
<td>6.6</td>
<td></td>
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<tr>
<td>9</td>
<td>TV usage (Het-Q time/day)</td>
<td>67.2</td>
<td>23.7</td>
<td>11.8</td>
<td>21.1</td>
<td>23.4</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>BMI (Kg/m²) (Mean±SD)</td>
<td>24.76±4.87</td>
<td>25.92±4.39</td>
<td>25.73±4.70</td>
<td>25.55±4.30</td>
<td>26.95±3.20</td>
<td>26.81±4.13</td>
<td>0.003</td>
</tr>
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<td>11</td>
<td>Waist Circumference (cm) (Mean±SD)</td>
<td>88.84±12.27</td>
<td>98.81±11.50</td>
<td>92.06±10.24</td>
<td>92.98±12.02</td>
<td>96.83±12.93</td>
<td>94.86±10.95</td>
<td>0.005</td>
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<tr>
<td>12</td>
<td>Incomes (in Rs/month)</td>
<td>14539.96</td>
<td>27399.66</td>
<td>27399.13</td>
<td>27399.13</td>
<td>27038.18</td>
<td>44217.82</td>
<td>0.000</td>
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<tr>
<td>14</td>
<td>Sitting (in hour) (Mean±SD)</td>
<td>0.63</td>
<td>1.70</td>
<td>0.63</td>
<td>0.70</td>
<td>0.70</td>
<td>2.63</td>
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<tr>
<td>15</td>
<td>TV watching (in hour) (Mean±SD)</td>
<td>3.12±4.13</td>
<td>2.01±4.68</td>
<td>3.40±1.17</td>
<td>2.22±17.28</td>
<td>29.90±13.20</td>
<td>33.60±10.97</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Sleeping (in hour) (Mean±SD)</td>
<td>11.05±7.23</td>
<td>12.35±6.53</td>
<td>8.41±5.74</td>
<td>9.25±6.65</td>
<td>11.47±8.28</td>
<td>11.47±8.28</td>
<td>0.013</td>
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<tr>
<td>17</td>
<td>TV watching (in hour) (Mean±SD)</td>
<td>0.84</td>
<td>1.84</td>
<td>0.35</td>
<td>0.70</td>
<td>0.70</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Sitting (in hour) (Mean±SD)</td>
<td>15.84</td>
<td>28.94</td>
<td>35.76</td>
<td>30.85</td>
<td>25.91</td>
<td>20.98</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Sleeping (in hour) (Mean±SD)</td>
<td>15.84</td>
<td>28.94</td>
<td>35.76</td>
<td>30.85</td>
<td>25.91</td>
<td>20.98</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>BMI (Kg/m²) (Mean±SD)</td>
<td>25.95±9.41</td>
<td>26.56±9.57</td>
<td>27.13±9.57</td>
<td>27.53±9.12</td>
<td>25.12±9.94</td>
<td>27.74±10.13</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Left HGS (Kg) (Mean±SD)</td>
<td>1.50±2.50</td>
<td>0.00±14.90</td>
<td>3.60±9.80</td>
<td>6.60±8.00</td>
<td>3.60±9.80</td>
<td>5.10±7.60</td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations**: SD- standard deviation; Min- minimum; Max- maximum; BC- backward community; SC- scheduled caste; FV- fruit and vegetables; BMI- body mass index; ADL- activities of daily living; SBP- systolic blood pressure; DBP- diastolic blood pressure; FBG- fasting blood glucose; HGS- hand-grip strength

Note: ‘p’ values were calculated from one-way ANOVA for continuous variables and chi-square test for string or categorical variables

TV watching time included watching serials, movies, songs, reality shows, sports matches, live shows, bhajans etc. in sitting position. These may be viewed in theater, TV, computer or laptop, mobile. This item also included surfing internet, social media use, chatting etc. in mobile. Computer or laptop use for billing, office work, and study purpose apart from above activities was also part of this item. For condition of this item subject should be in sitting position. Questions asked for both week days and weekend. Value was recorded in hours spend per TV watching per week. Classification will be used as per Grontved and Hu[6] study result.

Sitting time included activities spend in sitting position other than above item (i.e) chatting with friends, reading newspaper, office/shop, listening music, travel etc. Questions asked for both week days and weekend. Value was recorded in hours spend per week. Classification will be used as per Chau et al.[14] study result.

Sleeping time included time spend in bed during night as well as day (napping). Questions asked for both week days and weekend. Value was recorded in hours spend per week. Definition for normal, short and long sleep will be used as per Cappuccio et al.[15]

**Measurement of Secondary exposure variables**:

All secondary exposure variables were self-reported. Education (classified into illiterate, upto 9th class, 10th class, 12th class, undergraduate, postgraduate, MPhill, PhD), Income as on summer 2015 (in Rs per month), smoking [yes/no; if yes frequency (number cigarettes per day or week)], alcohol habits [yes/no; if yes frequency (number of
times per week or month), food type (Vegetarian or Non-vegetarian including egg use), ghee use [yes/no; if yes frequency (number spoons per week)]. Income was classified according to Kuppuswamy’s socio-economic status scale (7 categories).\textsuperscript{15, 16}

IV. Future Plans

Apart from measuring aerobic fitness by 2020, we want to validate the physical activity, sedentary behaviors assessed by our questionnaire using pedometers. All the outcome variables, exposure variables will be measured at 5 year intervals to calculate incident rate and identify the determinants for CVD risk factors. We will also monitor the prognosis of CVD risk with reference to primary exposure variables. Use of physiotherapist in community level to promote physical activity, fitness will be another objective. Recent study from India shows promising result to control diabetes by using mobile technology.\textsuperscript{17, 18} Significance of mobile use in promoting physical activity, fitness- thus preventing CVD risk will be objective in future.

Ethical clearance: The whole procedure was retrospectively approved by institutional ethical committee vide letter no PTY/ 2016/ 555 dated 14\textsuperscript{th} October 2016.

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References