



**Prevalence of musculoskeletal complaints and primary degenerative conditions of
the lumbar spine and the weight bearing joints**

Summary of Ph.D. Thesis

Gábor Horváth M.D.

Head of doctoral school: Sámuel Komoly M.D. D.Sc

Head of doctoral program: Tamás Illés M.D., D.Sc

Tutor: Péter Than M.D., Ph.D.

University of Pécs, Clinical Center, Institute for Musculoskeletal Surgery,

Department of Orthopedics

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Introduction-Aims

Degenerative diseases of the lumbar spine and primary osteoarthritis of the weight bearing joints are the leading causes of musculoskeletal disability in the developed countries. The prevalence of these degenerative conditions rise with age, and exponential increase can be observed beyond the age of 50. The lack of sensitive and specific methods in epidemiology and clinical studies for the early detection and follow up of these diseases makes the early diagnosis difficult before irreversible changes develop. From 2000-2010 -declared as "The Bone and Joint decade" by the WHO- increased attention focused towards the research of musculoskeletal diseases. Among the primary goals was the improvement of epidemiological data supply.

In accordance with these aims, and to provide data for the first time in a Hungarian population, the prevalence of major joint and lumbar spine complaints and the underlying degenerative diseases were investigated in our studies.

In the first part of the study our aim was to screen the prevalence of low back, hip and knee pain using our own and other internationally validated questionnaires. Apart from complaints it was also our aim to measure general health and health perception of the sample using the SF 36 questionnaire.

In a second phase of the study, people complaining of low back, and/or hip and/or knee or pain and giving prior consent were invited for a clinical follow up in order to explore possible underlying degenerative conditions. This part of the study consisted of a physical examination focusing on musculoskeletal system, and a radiological screening of the participants. Our data were used to perform functional evaluation, and the X-rays to define osteoarthritis prevalence using internationally accepted scores.

Patients and Methods

Ten thousand individuals aged between 14-65 years living in three counties of the South Transdanubian region of Hungary were involved in the study. The sample was selected and provided by the Baranya County Division of the Hungarian Central Office of Statistics. 5515 of the examined population were female, 4485 male with an average age of 42.1 years. Since there is no generally accepted questionnaire for musculoskeletal symptoms and complaints, a self-made questionnaire was used to explore the prevalence of the diverse degenerative joint complaints. The questions focused on specific musculoskeletal complaints (e.g. difficulty to put on socks in the case of hip osteoarthritis). Furthermore the questionnaire incorporated questions of standardized, internationally used scores. In order to obtain data from the general physical and mental status of the examined people, they were asked to fill out the SF-36 questionnaire as well. Following the evaluation of musculoskeletal complaints, those who reported either low back or hip or knee pain, and had given written consent were invited for a clinical and radiological follow up in the search for lumbar spine degeneration and primary osteoarthritis. Altogether 682 (244 male; 438 female) with an average age 52.31 years (20; 67) came for a follow up. Detailed information regarding general health and musculoskeletal condition was obtained; patients were further categorized according to BMI. This was followed by a thorough musculoskeletal physical examination focusing on lumbar spine hip and knee joints. Following this standard bilateral view radiographs of the lumbar spine, AP pelvis and bilateral weight bearing of both knee joints were taken. Based on patient history and physical examinations Oswestry Disability Index was calculated. Lumbar spine degenerative conditions were categorized into four groups: discopathy, degenerative scoliosis, spondylolisthesis and spondylosis. Functional results (ODI) were compared with X-ray findings.

Radiographic evaluation was performed using the Kellgren-Lawrence osteoarthritis score. The diagnosis of hip and knee osteoarthritis was established at K-L $\times 2$ points, severe osteoarthritis at K-L $\times 3$ points in our study. Joint space width of the hip and knee joints were measured with 0.5mm accuracy on the AP pelvis and AP knee radiographs.

The narrowest part was recorded as joint space width. Using anamnesis data and our records, joint function was evaluated by calculating the Harris hip score, and Knee Society scores for the hip and the knee joints respectively.

Participants were categorized according to their BMI values: 1: under 25-normal, 2: 26-30-overweight, 3: 31-35-obese, 4: above 35- extremely obese. Associations between functional scores and radiographic findings were analyzed. The influence of BMI, age and gender on symptoms and osteoarthritis prevalence was further investigated.

Our results were statistically analyzed according to the following criteria. In the first part of the study descriptive statistics of a 10000 sample with 10000 was performed. Continuous variables were analyzed in terms of mean \pm standard deviation. In the second part a sample of 680 was analyzed using Chi2 test to establish data correlation. Standard Student's *t*-test for paired samples or one-way ANOVA was performed for comparing data, as needed. A *P*-value <0.05 has been valued as significant. All analyses were carried out with SPSS software for Windows version 11.0.

Results1:Musculoskeletal complaint in a sample of 10 000

Low Back Pain

9957 people out of the 10000 surveyed answered our questionnaire completely making further data processing possible. To the question: "have you experienced low back pain recently" 4389 people (44.1%) gave a positive answer. Upon examining the sex specific prevalence we found that almost half of surveyed women were affected by low back pain (48.1%), whereas only 39.1% of men reported pain at the time of the survey. Age specific investigations showed that the average age of the affected population was 46.71 years, and in those without pain was 38.5 years.

Hip Pain

2207 persons of the 9957 surveyed complained of hip pain (22.2%). 698 of the affected (15.6%) were male, 1509 (27.5%) were female. Prevalence of hip pain showed an increasing tendency with age (2.9%-38.5%).

Knee Pain

The prevalence of knee pain in the examined group exceeded the number people suffering from hip complaints. To the question "have you experienced knee pain recently?" 3015 persons (30.3%) (1290 male; 1725 female) gave positive answer. The female dominance was not significant. When observing the age specific prevalence of the symptoms, a constant increase from 12% in the youngest age group (14-19) to 47.8% in the oldest (60-65) was seen.

SF 36 questionnaire

The questionnaire containing 36 questions explores 8 health dimensions. Normal values of the examined population were defined

| | Physical function | Physical roles | Bodily Pain | General Health | Vitality | Social Functioning | Role Emotional | Mental Health |
|-----------|-------------------|----------------|-------------|----------------|----------|--------------------|----------------|---------------|
| N= | 9630 | 9929 | 9518 | 9941 | 9817 | 9894 | 9940 | 9674 |
| Mean | 80,80 | 63,45 | 72,15 | 59,95 | 58,86 | 88,46 | 77,62 | 70,14 |
| Std. dev. | 28,09 | 44,41 | 34,29 | 27,79 | 24,42 | 20,96 | 39,34 | 22,48 |

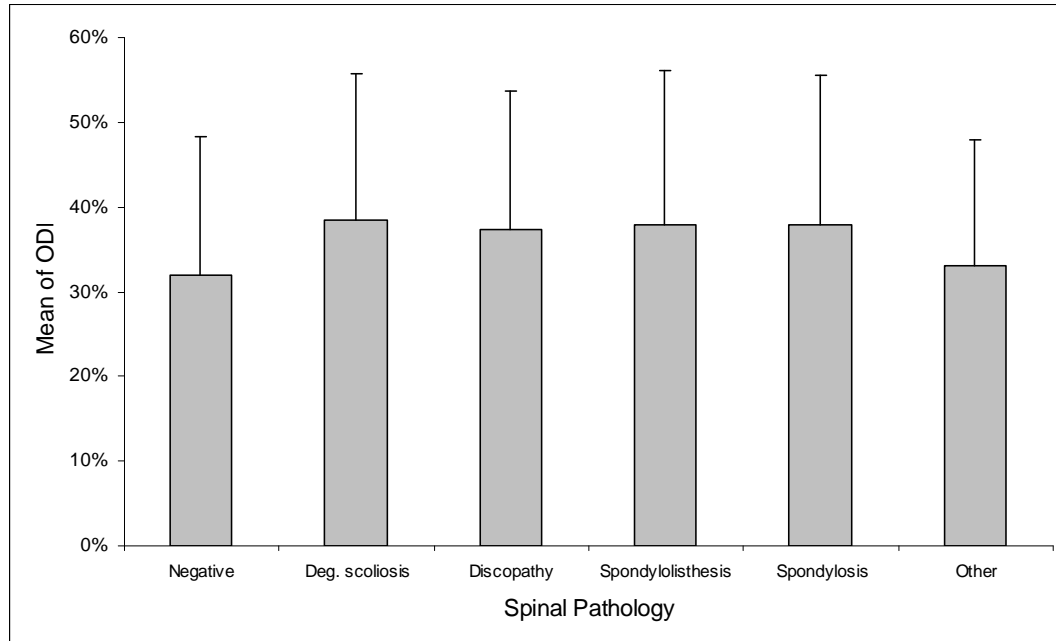
By exploring the 8 health dimensions of the SF 36 questionnaire, and comparing our results with international data, we found that except for the social functioning all values were inferior to the international sample. We also found that general health status of the examined population worsened more progressively with age.

Results 2: Objective evaluation of degenerative disease-prevalence data

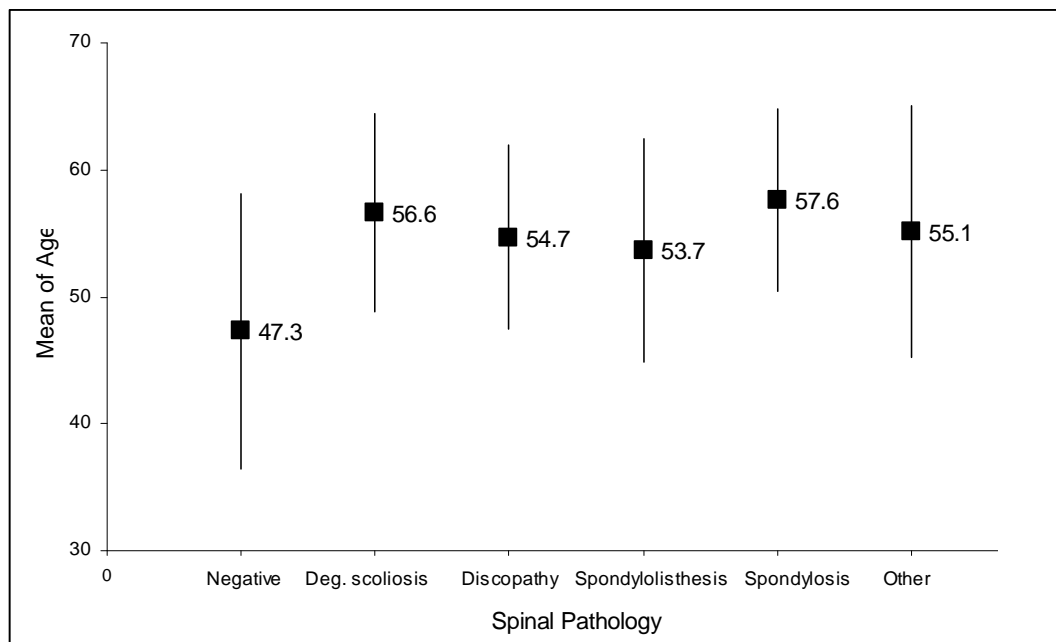
Lumbar spine degenerative disorders

682 (241 male, 441 female) person came for clinical assessment. Average age at the time of the investigation was 52.3 years (16, 67). Average Oswestry Disability Index (ODI) was 35.1%. Following radiological analysis patients were categorized into groups. 290 had no sign of spinal degeneration, on 160 radiographs discopathy, 158 spondylosis, 35 degenerative scoliosis, 12 degenerative spondylolisthesis, and 27 other alterations were recorded. Functional scores (ODI) of the different radiological groups were compared.

Statistically significant difference was detected only in the radiological negative group vs. all other groups with spinal pathology ($p < 0.05$).



Regarding patient age there was also significant difference ($p < 0.05$) between individuals having no alteration on the X-rays and those having spinal pathology as shown below



Due to the low number of cases, degenerative scoliosis, spondylolisthesis and other pathologies were excluded from further statistical analysis. Regarding BMI, radiologically negative patients were slightly overweight (27.8), whereas 29.9 and 30.2 averages were recorded at patients with discopathy and spondylosis respectively. This difference was not significant.

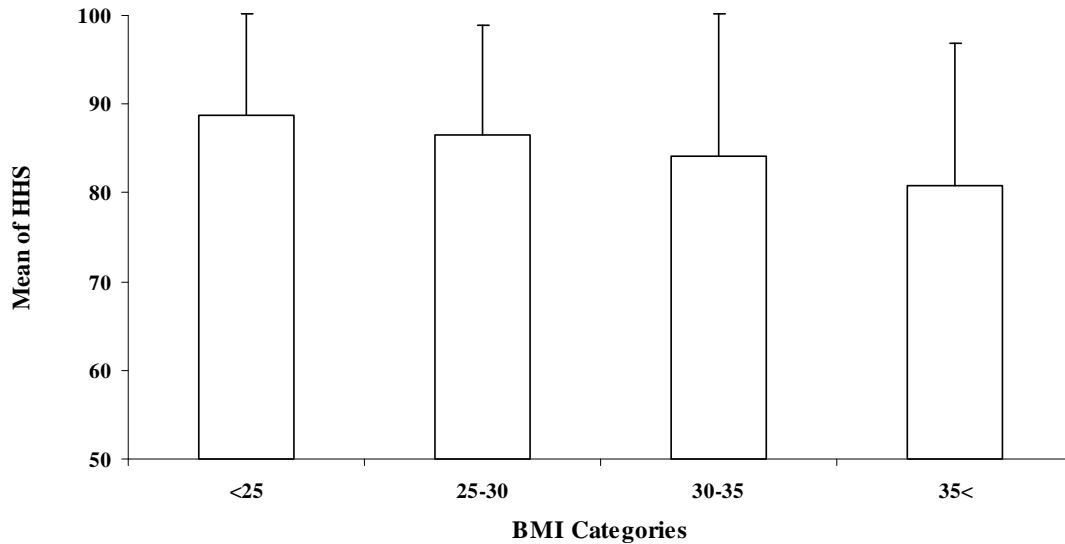
Hip Osteoarthritis

661 radiographs met the inclusion criteria and thus radiological analysis possible for hip osteoarthritis evaluation.

Regarding hip osteoarthritis prevalence 101 hips of 63 women and 69 hips of 46 men had Kellgren- Lawrence $\times 2$, out of which 18 had Kellgren-Lawrence $\times 3$. Overall 16.49% had hip osteoarthritis with 2.7% having severe osteoarthritis. Radiomorphological classification was performed only in case of severe osteoarthritis according to Mészáros. Primary proximal central type was found in 9 cases, primary proximal with secondary subluxation in 7 cases, destructive pattern in 2 cases. In 1 case secondary dysplastic osteoarthritis was detected.

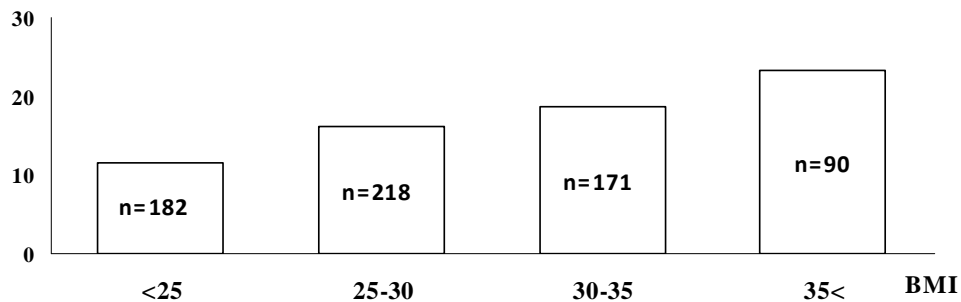
Harris hip score was calculated in 682 cases, and averaged 85.72 points. Patients with osteoarthritis had an average value significantly lower (77.37) in comparison with the negative reference group (87.75) ($p < 0.05$). Visual analogue scale for hip pain was given by 661 patients and averaged 2.9 points. These values showed a significant negative correlation with the Harris hip score values ($p < 0.05$). The associations between BMI vs. Harris hip score values are summarized below:

Effect of BMI on Harris Hip Score



The prevalence of hip osteoarthritis with respect to the BMI values is presented below

Prevalence of Hip OA (%)



Average JSW was 3.56 for the right and 3.52 for the left hip joints.

We investigated whether age influence on the different hip parameters and BMI.

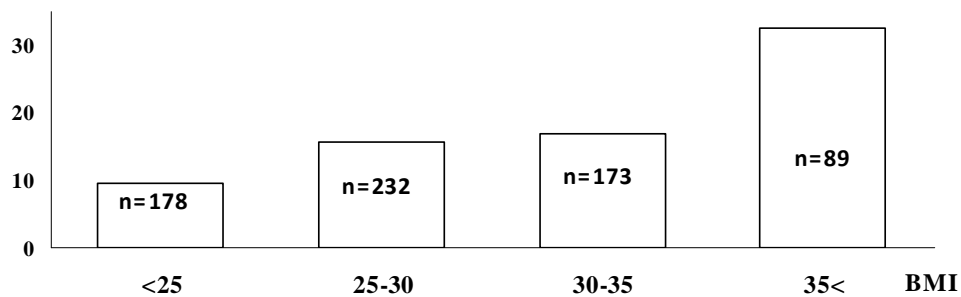
BMI, Visual Analogue score showed significant positive, joint space width and Harris hip score significant negative correlation ($p < 0.05$).

Knee Osteoarthritis

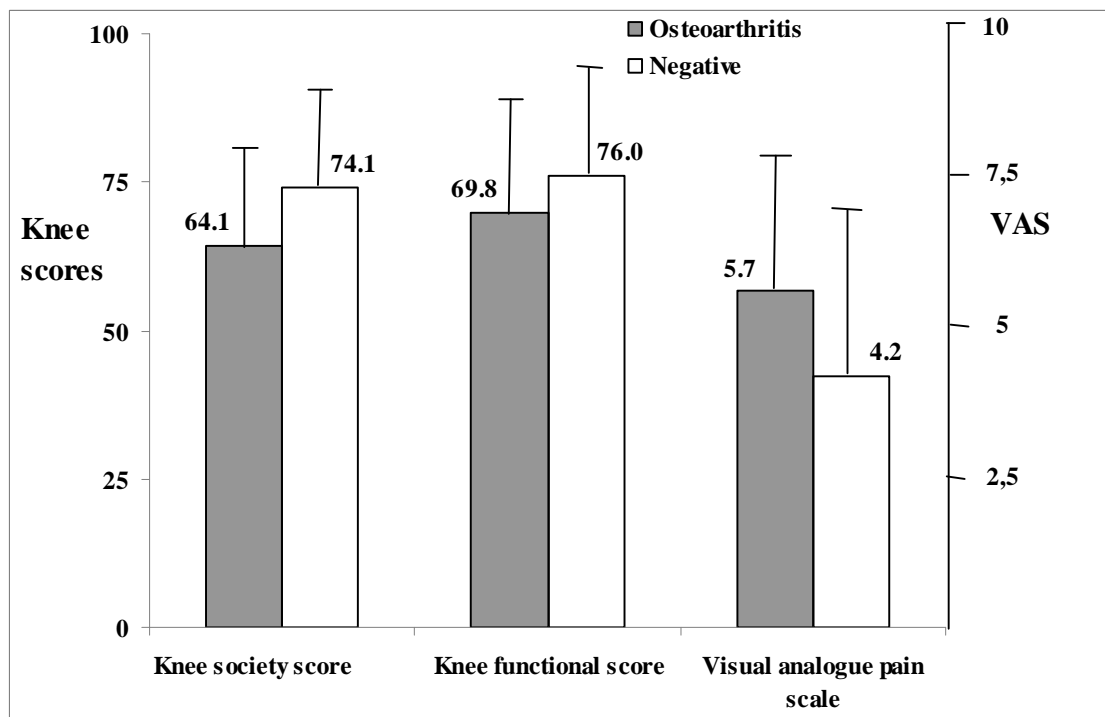
117 knees of 70 women and 68 knees of 41 men had Kellgren- Lawrence $\times 2$, out of which 20 had Kellgren-Lawrence $\times 3$ which means 16.54% knee osteoarthritis prevalence with

2.9% having advanced osteoarthritis. Similarly to the hip joint, BMI average was significantly higher in the osteoarthritic group (31.13), than in the control group (28.39) ($p < 0.05$). A positive correlation is clearly visible: only 10% of the normal BMI group had osteoarthritis, whereas in the extremely obese group almost a third of the patients were affected.

Prevalence of Knee OA (%)



Knee society score, knee functional score and visual analogue pain scale showed that patients with proven osteoarthritis have significantly lower values than radiographically negative cases, showing marked pain and worse functional status.



The influence of age on knee osteoarthritis could also be proven as 56.8 years vs. 51.4 was observed in the osteoarthritic, and the control group respectively ($p < 0.05$). We found that average JSW was 2.9 mm in the affected, compared to the 4 mm in the negative control group.

Spinal degenerative conditions were cross matched with hip and knee x-rays, where patients having 2Ö points according to the Kellgren-Lawrence classification were defined as having osteoarthritis of the hip and knee joints. We found that the number of patients affected by hip and knee osteoarthritis is significantly higher in those having spinal degeneration ($p < 0.05$). The associations are shown below:

| | | Knee Pathology | | |
|------------------|--------------|----------------|----------------|------------|
| | | Negative | Osteoarthritis | Total |
| Spinal pathology | Negative | 266 | 26 | 290 |
| | Discopathy | 126 | 34 | 160 |
| | Spondylosis | 115 | 43 | 158 |
| | Total | 505 | 103 | 608 |

| | | Hip Pathology | | | |
|------------------|--------------|---------------|----------------|-----------|------------|
| | | Negative | Osteoarthritis | THR | Total |
| Spinal pathology | Negative | 268 | 21 | 1 | 290 |
| | Discopathy | 128 | 27 | 5 | 160 |
| | Spondylosis | 109 | 43 | 6 | 158 |
| | Total | 501 | 91 | 16 | 608 |

Discussion

Musculoskeletal complaints belong to the leading health problems in public health. Beside short-term absenteeism, they are also the cause of permanent disability in Hungary. While earlier mainly the elderly population was affected by these problems, nowadays musculoskeletal complaints appear in younger age groups as well. In the background of the complaints a demonstrable disease can not always be diagnosed as well as vice versa. Therefore, later studies of international literature reporting on prevalence data differentiate between musculoskeletal problems, joint complaints, radiological osteoarthritis, radiological symptomatic osteoarthritis, and severe arthritis. Earlier, no representative epidemiological data on musculoskeletal complaints and survey of objectively diagnosed arthritis was supplied in Hungary. Our aim in the current study was to provide epidemiological data in this field. Our survey of the prevalence of musculoskeletal complaints was carried out by using internationally validated questionnaires on ten thousand individuals in the South Transdanubian Region. Methodologically, personal interviewing was preferred, which resulted in a response rate of more than 99% of the examined, which is superior response rate compared to other studies.

In our study 44% of the examined reported currently existing low back pain, this is clearly a high rate. In international literature the point prevalence ranges between 15-30%. The most affected age class is 40-60 years of age, which is compatible with the average age of 46.7 found in our survey. The cause of high prevalence is diversified: high rate of response, differences in methodology and sample selection, definition of low back pain, individual differences in the perception of pain. In our survey the high rate of prevalence can be explained with the increased awareness of disease due to lower quality of life, and the high share of physical workers (32%) in our study. The origin of low back pain is multifactorial, and in most of the cases detectable pathological differences can not be demonstrated in the background, therefore the screening and identification of the risk factors are important. Among the individual predisposing factors the role of previous episodes of low back pain, gender and age are significant. In the survey the casual role of earlier existing low back pain was clearly detectable. 60% of the respondents with

currently existing low back pain experienced earlier low back pain. The role of age as a risk factor, specifically over 50 years of age, can be related to the increased degenerative alterations. In case of gender, we found that women are with 9% more affected than men. A positive correlation between BMI and low back pain is also observable; however it is not as close as in the case of risk factors mentioned earlier. Our observation, namely, that parallel with age the share of overweight and obese individuals gradually increased, makes the acknowledgement of the independent role of BMI as a risk factor difficult. According to our study 22.3% of the respondents had hip complaints. This rate can be correlated with the international literature. In all these studies ó including ours- higher age, female gender, increased BMI, and in the USA African race indicated higher risk. The later was explained by authors with the frequently increased BMI and depressive symptoms of the affected, which is associated with increased perception of pain. Differences in the frequency of musculoskeletal complaints between the international samples and the sample examined by us, can be explained on one hand with the lack of accurate localization of pain (regarding low back pain and hip pain), on the other hand with the health consciousness set out below, and with the indeed worse domestic health indicators.

According to the literature the occurrence of knee pain as well as the below discussed radiological arthrosis is consequently higher than hip pain. Beside knee osteoarthritis which occurs in elderly age, knee complaints are also observed among the younger population in connection with sport injuries, inflammatory diseases, and autoimmune diseases. In our survey 30.4% of the respondents reported of knee pain. The importance of screening knee pain was also emphasized by English authors. According to their observation at the same time with the occurrence of knee pain, significant deterioration of the physical functions appears, measured with the SF36 questionnaire, which even in case pain relief does not reach its original level. Since the appearance of the individuals undergoing our survey at the clinical control examination was not guaranteed in each case, a comparative analysis was not carried out; instead our results were correlated with earlier international results. According to this, among the 8 parameters registered in SF36 only one was found ó namely reduced social functioning due to health related problems - in which the South Transdanubian data and international data were similar. In the

knowledge of the full set of data this data must refer to the adverse health consciousness, and limited awareness of disease due to objective conditions. As a result of the clinical survey degenerative lumbar spine degeneration was found in 57.5 % of the cases. In lack of a quantitative internationally validated radiological evaluation system the comparison of data is of course difficult. This, in our estimate high occurrence is not surprising, since all these individuals experienced earlier low back pain, and the average age of the objects of the clinical examination was higher than that of the individuals undergoing the survey. The average of the Oswestry Disability index was 35,1% in the full sample which belongs to the category of moderate disability.

According to literature data among the radiomorphological risk factors there is a moderate positive correlation between the disc degeneration, intervertebral space narrowing, sclerosis, spondylophytes and non-specific low back pain. In these studies-as opposed to our observations- spondylolisthesis and spondylosis was not associated with higher risk of pain. In a later study- in which more than 3000 low back radiographs were evaluated- from the earlier mentioned parameters intervertebral space narrowing and multi-segmental disc degeneration showed the closest correlation with pain. This contradicts to an American study in which CT scans were evaluated in a group with an average age of 52.6. They found in almost two-third of the cases degenerative alterations, among which only in the case of spinal canal stenosis was in strong positive correlation with low back pain. In our study regarding the effects of certain degenerative radiograph alterations on function no significant differences could be verified.

Hip osteoarthritis was found in 16.5 % of the examined. Dagenais in a review study reports 0.9-27 % prevalence of hip osteoarthritis with a gradually increasing tendency over the last years. Compared with the European average of 10.1 %, our result is by all means high, even if the examined reported previous hip complaints. Within a limited number of publications a recent American study describes prevalence of symptomatic osteoarthritis with a near 10 % rate. The same study found in 2.5 % of the cases severe osteoarthritis. In our cases the share of these cases was 2.9 %. Generally the clinical status and the progression of the disease are well followed by the radiographs. Still it is effective to differentiate between the different prevalence types, since the cause of hip pain is diverse, and in several cases a radiological advanced osteoarthritis is associated



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with a clinically asymptomatic patient. According to our examinations in the case of the radiologically affected hips a significantly low Harris hip score, and a significantly high VAS score was found compared with radiologically negative hips.

Regarding knee osteoarthritis my results showed better comparability to international data. The symptomatic osteoarthritis prevalence was 16.1 % while the advanced osteoarthritis was 2.7 %. In a big American sample the value of the symptomatic osteoarthritis was 16 % as well, and advanced osteoarthritis was found in 8 %. This latest result is not surprising considering the share of obese patients in this study. In a Scandinavian sample of young population a 1.5 % prevalence was reported, while an Asian study examining a population over 65 years of age found 30 % prevalence, which demonstrates the role of age as a risk factor in the development of osteoarthritis. The Knee Society Score the functional knee score and the VAS score showed significantly lower value in the osteoarthritis group.

From the several risk factors that play a role in the occurrence and progression of hip and knee osteoarthritis, we examined the role of bodyweight (BMI) and age in detail. Review studies report the increase of hip and knee complaints parallel with BMI increase, and a radiological correlation is also demonstrable. However, this correlation is closer in case of the knee joint. With BMI growth the prevalence of knee osteoarthritis gradually increases, with outstanding change above BMI value of 30. Considering age it can be clearly stated that parallel with aging both the frequency of complaints and the number of the radiological structural alterations- thus the prevalence of hip osteoarthritis and knee osteoarthritis increases.

The examination of cross-prevalence was important for several reasons. The so called "hip-spine syndrome" was first published by Offierski and Macnab. According to them identification of the pain source and defining disability level are of prime importance. In lack of these the mixed clinical picture often leads to misdiagnosis and faulty treatment. A later study reported significant low back pain relief following total hip replacement in case of patients who had both low back and hip pathology prior to the operation. According to Japanese authors progressive knee osteoarthritis causes increased lumbar lordosis as a compensatory answer to increased flexion contracture in the knee joint. This phenomenon was defined as knee spine syndrome. According to our observations higher



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prevalence of hip and knee osteoarthritis was observed on those patients who were also affected by lumbar spine degeneration. Whether this finding is due to the higher age of the affected or other factors need further investigation. The screening of the patients is therefore even more important, as inferior functional outcome can be anticipated in case of total hip and or knee arthroplasty when spine degeneration is present at the time of the operation.

As a conclusion our observations and prevalence data show good comparability with international observations despite the missing consensus in radiological definition of osteoarthritis. Even though from epidemiological point of view 16% osteoarthritis prevalence is significant, more clinical relevance has the progressive arthritis group (2.7-2.9% respectively) with a possible need for total hip or knee replacement in the near future. This number may well be even higher due to financial problems, low patient compliance and the number of non appearance in the follow up. We suggest that patients with beginning arthritis should be frequently reevaluated and treated conservatively in order to slow rapid progression.

Novel Findings

Prevalence data was reported for the first time in a representative Hungarian sample on musculoskeletal complaints in adults and adolescents:

Low back pain prevalence in adults was 44.1%, Hip pain was in 22.2% present, whereas knee pain was reported by 30.3% of the sample

Musculoskeletal complaints affected the youngest examined age group (14-19): low back pain, hip and knee pain percentages were: 12.5-2.9-12 % respectively

With SF-36 quality of life questionnaire we explored the physical and mental status of the examined and defined the normal values of the sample in all of the 8 dimensions

During the clinical follow up prevalence of lumbar spine degenerative conditions and primary osteoarthritis of the weight bearing joints was defined using validated scoring systems:

Lumbar spine degeneration was observed is 57.5%

Hip Osteoarthritis prevalence was 16.49% with 2.9% having severe arthritis.

Knee osteoarthritis prevalence was 16.54% with 2.7% having severe arthritis.

Following radiological evaluation, functional evaluation of the lumbar spine and of the major joints of the participants was carried out (ODI, HHS, and KFS):

In all three cases significantly lower functional outcome was detected by those who were affected by radiological degeneration.

The role of age and BMI as risk factors was investigated:

Age plays a significant role in the development of lumbar spine degeneration, hip and knee osteoarthritis: significant difference between radiologically negative and positive cases was observed.

BMI values in case of lumbar spine degeneration were higher yet insignificantly versus the control group.

The role of BMI as a risk factor is much more clear in case of hip and knee osteoarthritis. Significantly higher hip and knee osteoarthritis prevalence was detected as BMI values rise.

Co-occurrence of Lumbar spine degeneration and osteoarthritis was investigated:

Significantly higher hip and knee osteoarthritis prevalence was observed by those who were had lumbar spine degeneration at the same time.

List of publications

Publications related to the Ph.D thesis

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3. **Horváth G.**, Koroknai G., Ács B., Than P., Illés T.: Coxarthrosis klinikai és radiológiai prevalenciája dél-dunántúli betegpopuláción történt felmérés alapján. Magyar Traumatológia, Ortopédia, Kézsebészet, Plasztikai Sebészet 2009; 52(1):31-36
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