Original Paper

Hip Osteoarthritis-Clinical-Statistical Study and Surgical Treatment

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ABSTRACT: Osteoarthritis (OA) of the hip, also known as coxarthrosis, is a degenerative disease marked by gradual biomechanics alterations cause by articular cartilage damage in the coxofemural joint. The goal of this study was determining the incidence of patients with hip osteoarthritis who undergo surgery (hip arthroplasty) within the Department of Orthopedics and Traumatology of the Emergency County Hospital of Drobeta-Turnu Severin, hospitalized between January 2014 and December 2019. Furthermore, we proposed gathering details about incidence, distribution according to age group, gender, living conditions, and type of arthroplasty used in studied patient group. The study included 485 patients with hip OA mainly diagnosed in elderly patients, 87.83% being over 60 years old. In terms of gender, the disease primarily impacted women, with a female/male ratio of 2/1.

KEYWORDS: *Hip osteoarthritis, risk factors, surgical treatment, hip arthroplasty.*

Introduction

Hip osteoarthritis (coxarthrosis) is a chronic inflammatory condition characterized by the progressive destruction of hip articular cartilage, causing pain and severe restriction of joint function [1].

It is one of the most common joint diseases worldwide being predominantly found in developed countries rather than in developing countries and is expected to increase in the coming years [2].

The phenomenon of population ageing, increasing life expectancy as well as risk factors, particularly a sedentary lifestyle and obesity, have suggested that the number of people who will develop this condition will increase substantially in the coming decades [2,3].

Epidemiological studies identified some risk factors for hip osteoarthritis, such as: female sex, aging population, obesity, smoking and microtraumas of the coxo-femoral joint, especially in certain jobs [4,5].

Among adults, hip osteoarthritis is a common cause of pain and disability, affecting approximately 27% of the adults aged ≥45 years old, and is a predominant reason for total hip replacement surgery (total hip arthroplasty) [6].

Observational studies showed a higher frequency of hip osteoarthritis in women compared to men and an increase in its prevalence with aging.

With the aging of the population but also with the increase of obesity worldwide, it is anticipated that this condition will become a major problem for global health systems [7].

Coxarthrosis causes joint discomfort and osteoarthral changes in both men and women, resulting in significant lower-limb impairment [8].

The most common dysfunctionalities are: trouble walking, particularly when climbing stairs, difficulty getting up and down from car or bed, and difficulties walking on rough terrain.

Osteoarthritis is the main contributor to the limitation of daily activities, causing difficulties in movement, difficulties in carrying objects and difficulties in dressing, changing the lifestyle of patients.

All these lifestyle changes lead to the need for human assistance from family or help from health professionals in order to have a relatively normal life [9].

Hip pain and motor dysfunction can substantially affect health, limit daily activities and significantly reduce the quality of life [10].

A straightforward pelvic X-ray is used to diagnose coxarthrosis, and Kellgren and Lawrence's classification helps to determine the condition's stage [11].

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Depending on the changes present on the hip x-ray, hip osteoarthritis was classified into 4 stages [12-16]:

-stage I (incipient osteoarthritis), possible medial joint space becoming narrower and potential osteophytes near the femoral head;

-stage II (mild osteoarthritis), mild sclerosis, definite reduction of the lower joint space, and organized osteophytes;

-stage III (moderate osteoarthritis), deformity of the femoral head and acetabulum, sclerosis (subchondral osteocondensation), bone cysts, and marked narrowing of the articular space;

-stage IV (severe osteoarthritis), large osteophytes, complete joint space loss with sclerosis and cysts, and significant femoral head and acetabular deformation.

Figure 1. Radiological aspects of coxarthrosis according to the progression stage (Kellgren and Lawrence classification) A-stage I=minimal narrowing of the articular cartilage space, B-stage II=articular cartilage space moderately narrowed, C-stage III=severe narrowing of the articular cartilage space, multiple osteophytes, D-stage IV=disappearance of articular cartilage space, bone sclerosis (subchondral osteocondensation), large osteophytes in the femoral head or acetabulum.

Aim

The objective of this study is to examine the clinical and demographic information on hip OA patients hospitalized and treated at the Emergency County Hospital of Drobeta Turnu Severin between January 2014 and December 2019.

Additionally, the study investigates risk factors associated with hip OA, their impact on disease onset and progression, and the surgical interventions selected for treatment.

Material and Method

485 patients, ranging in age from 26 to 95, were included in the study and received treatment in the Orthopedics-Traumatology Department of the County Emergency Hospital of Drobeta Tr. Severin, between 2014-2019 for hip OA.

A comprehensive clinical and paraclinical examination was performed on every patient; for each individual patient, clinical-biological indicators such as index of body mass (BMI), the presence or absence of associated diseases (HTA, obesity, osteoporosis) and risk factors (exposure to cold and moisture, trauma, chronic smoking, alcohol consumption, anti-inflammatory use, etc.) were analyzed.

Following the use of pelvic x-rays for the coxo-femoral joints, the Kellgren and Lawrence classification was used to determine the coxarthrosis stage (Figure 1), only patients with stages 2-4 coxarthrosis were included in the study.

The criteria for inclusion in the study group were the following:

• patients who signed the informed consent form;

• patients diagnosed with hip osteoarthritis, clinical and radiological stages 2-4;

• patients with a general condition favorable to surgical treatment.

Exclusion criteria:

• uncooperative patients;

• patients with comorbidities that were contraindicated for hip arthroplasty;

• patients who refused surgery;

The Ethics Committee of the University of Medicine and Pharmacy in Craiova and County Emergency Hospital of Drobeta Tr. Severin, Romania authorized the study, which was carried out in conformity with the Declaration of Helsinki.

Statistical assessment

The study utilized chi-square analysis to investigate the correlation between the variables.

A statistical technique called chi-square analysis is performed to evaluate if category variables significantly correlate with one another.

It is especially helpful in cases like ours when the variables being studied are categorical and the data is frequency-based.

The alternative hypothesis (H1) contends that there is a significant correlation between the variables, contrary to the null hypothesis (H0), which holds that there is no association at all.

To ascertain statistical significance, the derived chi-square value is compared to a critical value from the chi-square distribution with the relevant degrees of freedom.

When p was less than 0.05, the data were deemed significant, and H1 was approved.

Results

Analysis of the study group according to the age of patients

The patients in the examined group ranged in age from 26 to 95 years old with mean±SD of 72.29±9.52 years.

The patients were split up into seven age decades for the statistical analysis (Table 1) in order to determine the correlation between hip osteoarthritis and patients' age.

Table 1. Distribution of patients by age group.

Age group	21-30 years old	41-50 years old	51-60 years old	61-70 years old	71-80 years old	81-90 years old	91-100 years old
No. of patients	1	7	51	126	201	95	4

The analysis of the subject distribution by age highlighted the following aspects:

-one patient, (26 years old), had advanced hip OA in the 21-30 age range as a result of congenital hip dysplasia that went untreated as a child;

-hip OA incidence increased with age as in the 41-50 age group, only 7 patients (1.44% total) were documented and patients from 51-60 age group increased by more than 7 times, reaching 51 subjects (10.51%);

-within the age range of 61 to 70, 126 patients (25.98%) were recorded.

-age group 71-80 years old, was the largest group of patients with coxarthrosis, respectively 201, representing approximately 41.44% of all patients;

-in the age segment 81-90 years we registered a number of 95 patients (19,58% of the total group), and in the decade of age 91-100 years there were just four patients that were part of the study (about 0.87% of the whole batch) (Figure 2a, Figure 2b).

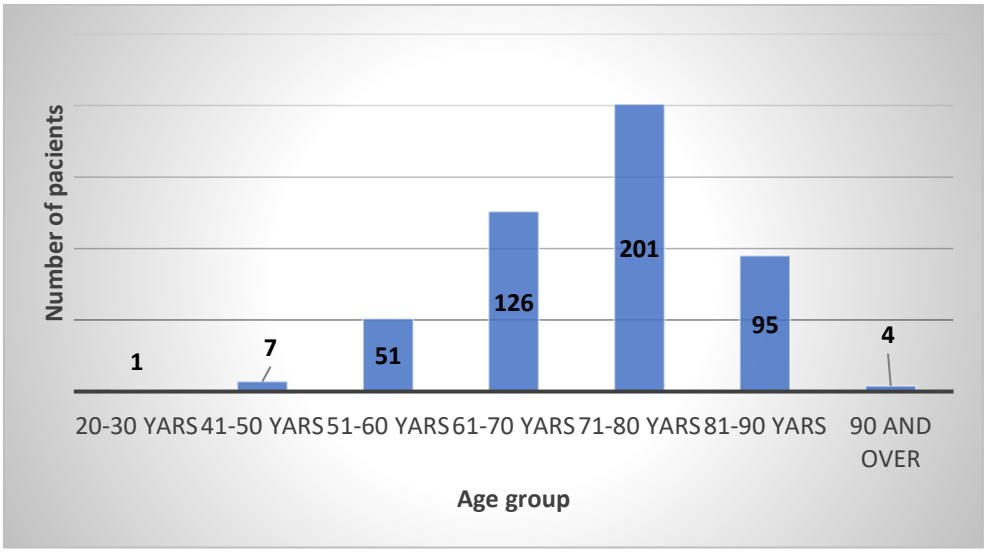

Figure 2a. Numerical distribution of the group of patients with coxarthrosis according to age.

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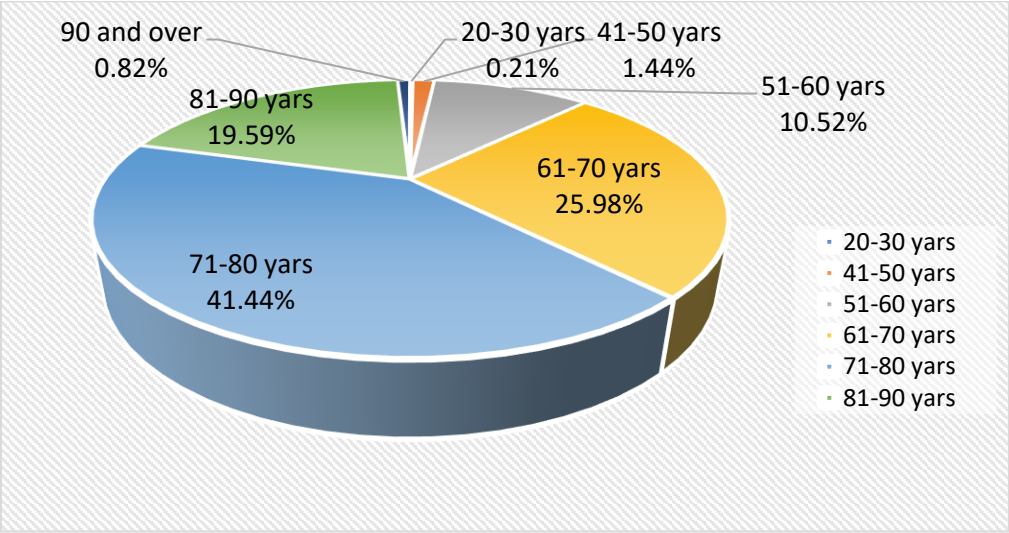

Figure 2b. Percentage distribution of patients in the study group, by age group.

A significant increase of hip arthritis after the age of 50 was found. 98.56% (n=478) of the patients are between 50-90 years old, and the largest share is those in the 71-80 age group, (44.76%, n=201).

Age group was found to be statistically significantly correlated with the stage of coxarthrosis as the chi-square statistic showed value of 157.7126 and p-value of less than 0.00001.

At p <0.05, the result is significant (Figure 3).

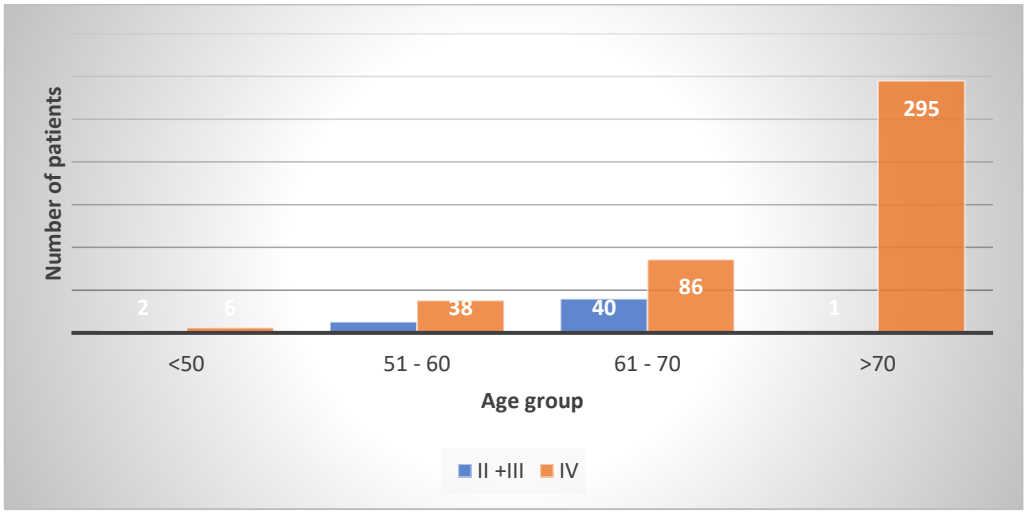

Figure 3. Staging frequency with age group.

Group analysis by gender

Analyzing the 485 patients, 324 (66.80%) were female, and 161 (33.20%) were male, the women/men ratio being 2/1 (Figure 4).

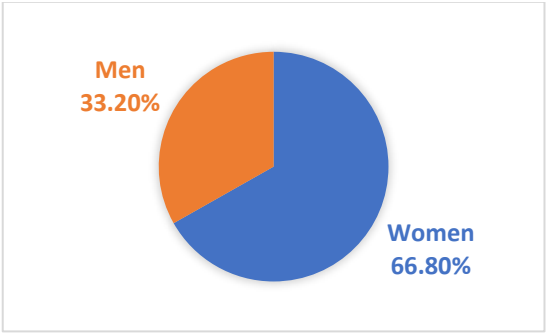

Figure 4. Patients' distribution with coxarthrosis based on gender.

We found no statistically significant differences between female and male distribution on stage as 1.2951 is the chi-square statistic. 0.255116 is the p-value. At p <0.05., the outcome is not significant (Figure 5).

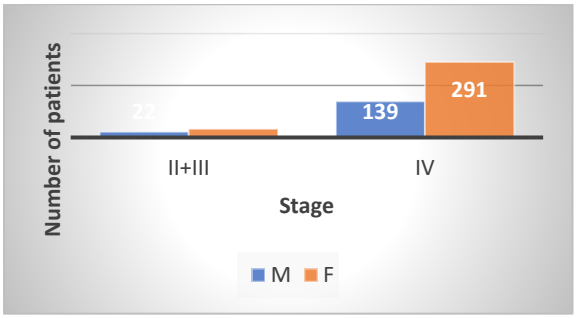

Figure 5. Staging frequency with gender group.

Group analysis by hip osteoarthritis stage

Following the clinical and paraclinical examination, coxarthrosis stage was established for each patient applying the classification system developed by Kellgren and Lawrence.

In our study, most patients were identified with advanced coxarthrosis, (stage IV).

Therefore, out of the 485 patients who made up the study group, 430 subjects (88.65%) had stage IV coxarthrosis, 52 subjects (10.72%) stage III, and only 3 subjects (0.63%) stage II hip OA (Figure 6).

According to the stage of hip OA 430 subjects (approximately 88.65%) were diagnosed with coxarthrosis stage IV and 11.35 % stage II and III, with statistically differences, chi-square statistic is 19.0585, the p-value is 0.000013.

The high percentage of coxarthrosis stage IV can be explained by the fact that the majority of patients were from rural areas, aged, and female (67% of patients), who postponed the presentation to the specialist doctor.

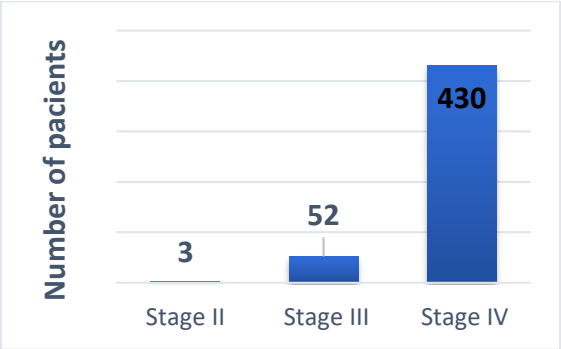

Figure 6. Distribution of coxarthrosis cases according to the stage of the condition.

Group analysis based on the environment of origin (rural versus urban)

In our study, participants also predominantly came from a rural environment respectively a number of 293 (60.41%) and 192 subjects (39.59%) from the urban environment (Figure 7), the ratio between rural/urban patients being 1.53/1.

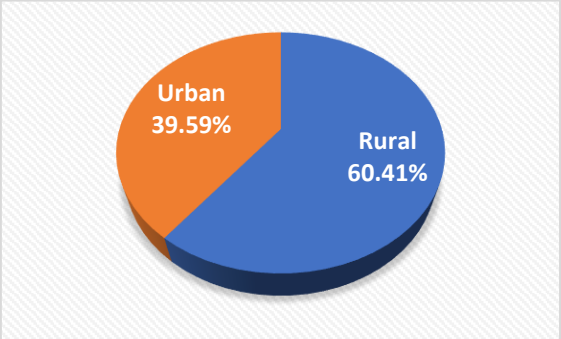

Figure 7. Patient distribution according to social environment.

In the rural area a statistically significant correlation was identified with stage IV OA (chi-square statistic 90.5098. P-value is less than 0.00001.

The result is significant at p <0.05 (Figure 8).

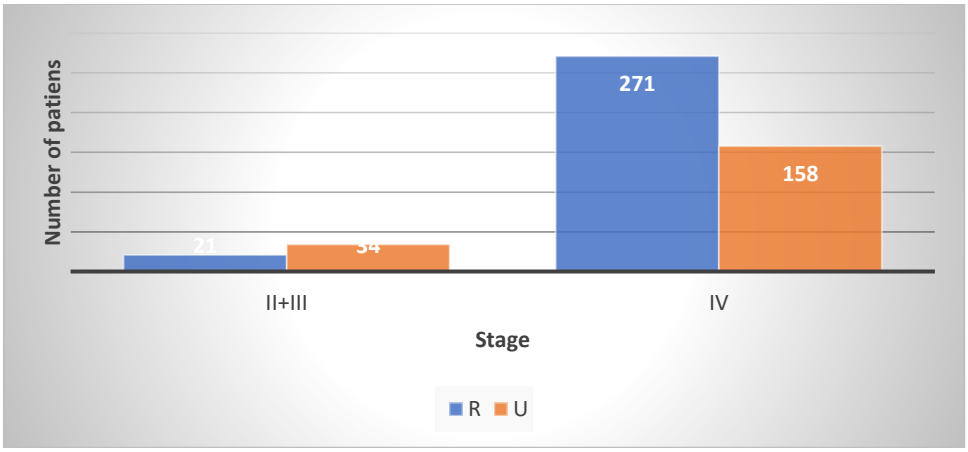

Figure 8. Stage of hip OA distribution according to social environment.

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The relationship between obesity and hip osteoarthritis

Obesity leads to changes in joint alignment and altered gait patterns, further contributing to cartilage degeneration.

Additionally, excess body fat can increase the production of inflammatory cytokines, exacerbating the inflammatory response in the joints.

To assess the relationship between obesity and hip OA, in our study we used index of body mass (BMI), which is the weight to height ratio. Obesity is defined at a BMI value ≥30kg/m2.

Compared to individuals of normal weight, the study showed that obese patients had advanced stages and a higher degree of disability.

Accordingly, 236 (55%) of the 430 patients with stage IV OA and 13 (25%) of the 52 patients with stage II and III OA were obese.

The two variables showed a substantial degree of correlation, as indicated by the 19.0585 chi-square statistic and the 0.000013 p-value.

The result is significant at $p < 0.05$ (Figure 9).

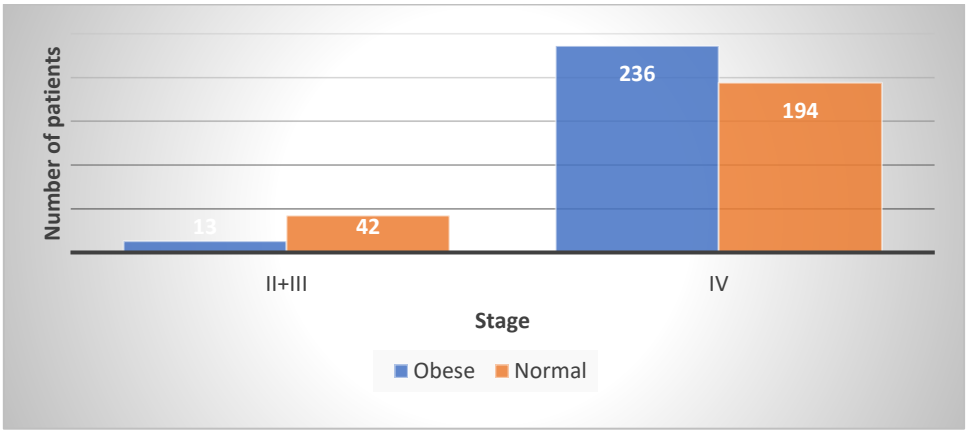

Figure 9. Correlations between coxarthrosis and obesity.

Group analysis according to the surgical treatment

The patients were split up into two groups for the study: acute patients hospitalized via the emergency department, and chronic patients from outpatient clinic.

The chronic patients with primary or secondary hip OA required total hip arthroplasty, cemented (PTC) or non-cemented (PTNC) depending on age and associated diseases.

There were 186 chronic patients, representing approximately 38.35% of the entire group.

The second category was represented by patients who presented via the emergency department with a femoral neck fracture and hip OA.

This category included a number of 299 patients, which represents 61.65% of the study group.

The treatment for these patients consisted in a bipolar arthtoplasty for individuals who fall within the 65-75 age range and a partial arthroplasty for patients over 75 years old.

In exceptional cases, in young patients (only in 2 cases from the group with femoral neck fracture and coxarthrosis) total arthroplasty with uncemented hip prosthesis was performed (Figure 10).

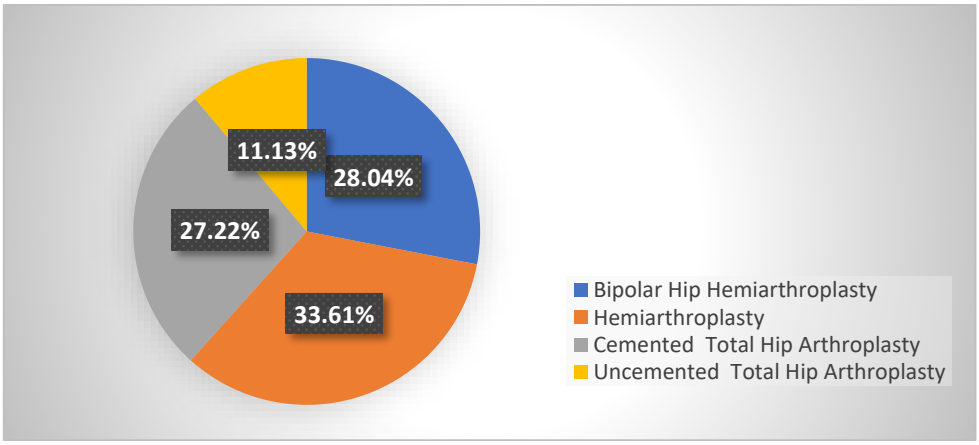

Figure 10. Types of prostheses used in surgical treatment.

Distribution of hip osteoarthritis cases by year

The total number of hip arthroplasties performed between 2014-2019 in the Orthopedics department of the County Emergency Hospital of Drobeta Tr. Severin was 485.

If in 2014 only 45 surgical interventions were performed (9.28% of the entire group), in 2019 118 arthroplasties were performed (24.33%), which shows the increase in the population confidence in surgical treatment of hip OA, the population easier access to such treatment and the specialization of the orthopedic team in the surgical treatment.

Between 2014 and 2019, there is an increase of 250% in the annual number of hip arthroplasties performed in the Orthopedics and Traumatology department. (Figure 11).

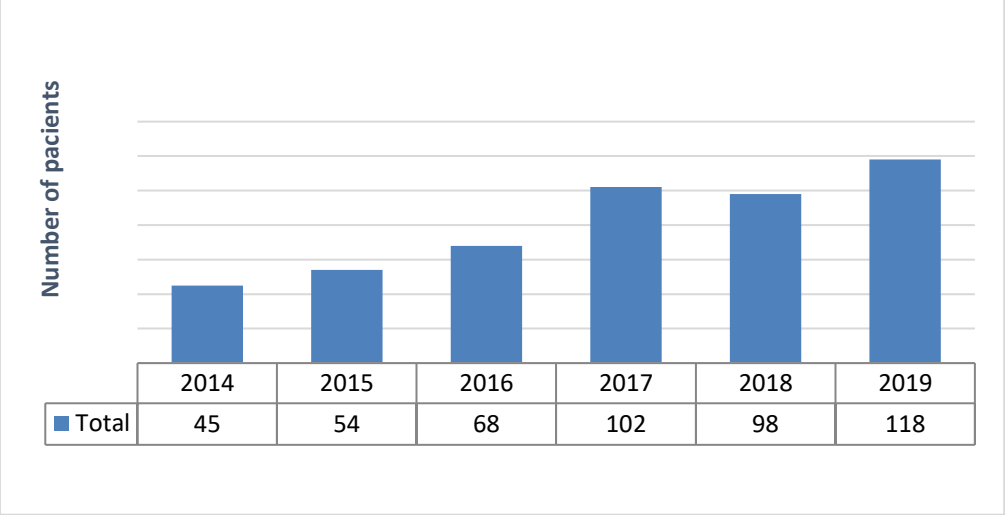

Figure 11. Distribution of arthroplasty cases by calendar year (2014-2019).

Discussion

Osteoarthritis is a chronic illness that results in the degeneration of the articular cartilage, subchondral and synovitis bone changes [17].

It has a high global prevalence being the fifth cause of disability worldwide [18].

Due to the great pain and joint movement restriction, OA of the hip has a strong effect on the standard of living of the affected people [19].

There are still few treatment options available for this condition despite its high prevalence; early therapies focused on pain management and, in advanced stages, total hip replacement.

Since the 1960s, total hip replacement has improved quality of life and produced excellent long-term outcomes for senior coxarthrosis patients by revolutionizing their treatment [20].

Coxarthrosis will place a significant pressure on healthcare systems worldwide in the coming years as the incidence and prevalence of this condition is increasing.

After examining the age distribution of the group under study, we can conclude that there is an increased frequency of hip osteoarthritis in people over the age of 60, with aging playing a significant role in the onset of changes at the joint level as a whole, particularly at the level of the articular cartilage.

Osteoarthritis of the hip occurs as a result of an imbalance between catabolic and anabolic activity at the hip joint level; age exacerbates this imbalance.

The imbalance is caused by cellular senescence, changes in the bone and cartilaginous matrix, and a decrease in the number of chondrocytes, making it unable to maintain homeostasis in the articular [21,22].

The increased frequency of osteoarthritis in the elderly is also confirmed by other studies that showed an incidence of only 7.6% in people aged between 18 and 44 years old, 29.8%,in people 45 to 64 years of age and 50% for people over 65 years old [23].

The data obtained by us are confirmed by numerous studies that showed that advanced age is associated with a higher prevalence of osteoarthritis because aging adversely affects the joint's capacity to defend against biomechanical stress [1,5,22,24].

In our study, analyzing the group according to sex, we found an increased prevalence of osteoarthritis in females.

This may be due to hormonal differences between men and women [25].

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It was shown that estrogen can have a beneficial effect on cartilage even; therefore, the decrease in estrogen during menopause represents an increased risk factor for developing osteoarthritis [26].

Other factors predisposing development of coxarthrosis in women are represented by the slightly different anatomy and kinematics of the hip joint in women compared to men [27-29].

Rural residents are more likely to acquire osteoarthritis than urban residents due to the increased physical demands of rural employment. In our study, the increased frequency of patients from rural areas (60.41%) is explained by their high physical activity and agricultural labor [30].

The fact that repetitive, over-stressing movements have a negative biomechanical impact on the hip joint demonstrates how work and physical effort increase the risk of OA, explaining the difference in the frequency of osteoarthritis amongst rural and urban environments.

Furthermore, the lack of access to adequate healthcare and preventive measures in rural areas may contribute to a higher frequency of osteoarthritis among rural residents [4,31-33].

Obesity is a major risk factor for OA due to the detrimental effects of excess weight and mechanical strain on the hip joint [34].

In the study group, we found that obese patients had more severe radiological abnormalities, substantial functional impotence, and advanced stages of coxarthrosis than normal weight patients.

Other studies have validated that a 5-unit rise in BMI increases the incidence of hip osteoarthritis by 11%.

Obesity has also been proven to hasten the progression of osteoarthritis by raising inflammation and cartilage damage in the joints.

These findings emphasize the importance of weight management in preventing and treating hip osteoarthritis. [4,35,36].

The treatment of choice for the studied group was total hip arthroplasty, a treatment by which the elements forming the hip joint, specifically the femoral head and the damaged acetabulum, were replaced with metal, plastic or ceramic components. 2 types of prostheses were used for hip endoprosthesis: total cemented (TCP) and non-cemented (TNCP) prostheses. TCP uses polymethyl methacrylate (PMMA) which is like a cement that ensures the fixation between the bone and the prosthesis, instead TNCP has porous surfaces in which the bone simply grows after implantation and is fixed without cement [37].

Total arthroplasty has been used in the following cases: femoral neck fracture in young people, advanced primary and secondary coxarthrosis (femoral head fractures, rheumatoid arthritis, congenital dislocation of hip) [38-40].

Total and hemi hip-arthroplasty (partial or bipolar prosthesis) are two surgical treatments for hip fractures associated with coxarthrosis in use today [41].

Hemi-arthroplasty only replaces the femoral head and neck, with the acetabular cavity remaining as such.

Hip hemi-arthroplasty is the recommended option for elderly population with reduced mobility due to the low risk of dislocation [39,42].

Our study showed an increase of hip arthroplasties between 2014 and 2019, which is likely to continue to grow in the coming years due to demographic changes, increased obesity, improved long-term outcomes of arthroplasty, and more active lifestyles of elderly people.

Additionally, advancements in surgical techniques and technology have also contributed to the rising trend in hip arthroplasties.

As the population continues to age, the demand for hip replacement surgeries is expected to grow further [43].

Conclusions

This clinical-statistical study on hip OA in Mehedinti County revealed a higher incidence of the disease in older adults (71-80 years old), women, obese individuals, and those who reside in rural areas.

For advanced cases of coxarthrosis, total hip replacement is the recommended course of action., as it offers a notable increase in life quality, a recovery of joint mobility, a major reduction in hip pain, and the ability to resume daily activities.

Hip OA is expected to significantly impact global health systems, so preventative measures and effective treatment strategies must be put into place for early diagnosis and tratement for improving outcomes and reducing healthcare costs.

Acknowledgments

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Conflict of interests

None to declare

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