

Prevalence and Risk Factor of Patellofemoral Pain and Knee Pain in Great Cairo Obese Population

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ABSTRACT

Introduction: The gradual development of diffuse anterior knee pain is characteristic of patellofemoral pain (PFP), which is made worse by activities that put stress on the patellofemoral joint, such as running, stair climbing, and squatting. While 23% of the overall population has PFP, athletes can have a prevalence of 35%.

Objectives: To identify the prevalence and potential risk factors of patellofemoral pain as well as knee pain in the heavily obese people living in Cairo.

Subjects and methods: This study was carried out in Great Cairo, Egypt. The SNAPPS questionnaire was utilized. 910 participants were male and female young adults, ranging in age from 18 to 40.

Results: The prevalence of PFP was shown to be 42.4%. Males had a prevalence of 42.2% for PFP and females 42.6%. With 127 individuals reporting knee pain, the overall prevalence of the condition was determined to be 14%. In males, 17.3% of the population experienced knee pain, while in women, it was 11.9%. Chi-squared test revealed that all risk factors (body mass index, job, marital state and age) were significantly linked with prevalence of patellofemoral (p-value<0.05) and knee pain (p-value<0.05) except gender that was insignificantly associated with patellofemoral pain (p-value=0.46).

Conclusions: Obese people living in Cairo, Egypt, had a relatively significant incidence of PFP and knee pain. People under the age of 40 had a greater incidence of PFP and knee pain in comparison with those in older age groups.

Keywords: Patellofemoral pain, Knee, Obesity, SNAPPS.

INTRODUCTION

The gradual development of diffuse anterior knee pain is characteristic of patellofemoral pain (PFP), which is made worse by activities that put stress on the patellofemoral joint, such as running, stair climbing, and squatting ⁽¹⁾. While 23% of the overall population has PFP, athletes can have a prevalence of 35% ⁽²⁾.

In addition to a low quality of life, PFP is associated with poor physical and mental health ⁽³⁾.

Some people think that PFP is a sign of patellofemoral osteoarthritis (OA) ⁽⁴⁾.

Many aspects related to biomechanics, anatomy, and psychology have been associated with PFP ⁽⁵⁾.

One risk factor for PFP is weak knee strength ⁽⁶⁾, and one predictor of poor rehabilitation results for anterior knee pain patients is decreased functional ability ⁽⁷⁾.

A higher body mass index (BMI) ⁽⁸⁾ was found in young individuals with PFP compared to pain-free controls, according to a systematic study. People with PFP are more likely to have bad long-term consequences if their BMI is higher ⁽⁹⁾.

Never before has the effect of BMI on functional ability and strength been investigated in the PFP population, although strong evidence suggesting that this condition is deleterious to those with PFP. Furthermore, no research has yet been conducted in this population using alternative measurements of body composition, such as lean mass and body fat, which appear to offer more precise and additional

information about the health effects of overweight and obesity than BMI alone ⁽¹⁰⁾.

The knee constitutes one of the biggest joints in the body and a highly complex joint overall ⁽¹¹⁾.

Knee pain can have many causes, but one of the most prevalent is PFPS ⁽¹²⁾.

When the patellofemoral joint is subjected to a particular type of weight-bearing motion, such as when the knee is bent, the result is pain behind the patella ⁽¹³⁾. In addition to affecting adolescents, athletes, as well as active adults, it is more common in females ⁽¹³⁾. Unfortunately, individuals with the disease may find it difficult to continue going about their regular lives as they attempt to avoid things that make their pain worse ⁽¹⁴⁾.

So, we aimed to identify the prevalence and potential risk factors of patellofemoral pain as well as knee pain in the heavily obese people living in Cairo.

SUBJECTS AND METHODS

The study took place in Great Cairo, Egypt, from May 2023 to October 2023, and used a descriptive cross-sectional questionnaire. Particularly targeted were the young people of Cairo who were obese. A self-administered questionnaire was used to collect the data. Utilizing Google Forms, the survey could be sent out digitally.

Participants: The study was carried out on 910 participants with a mean age of 27.3 years. They were among the general obese population of great Cairo, of both genders, their age was between 18 to 40 years, and their BMI was \geq (25 kg/m²). The participants were excluded if they were outside the age and outside body mass index range. The sample size was calculated for the two primary aims of the study.

To find out prevalence of PFPS and the significant risk factors (among 5 variables in the study which were gender, age, BMI, marital status and job) with PFPS sample size was calculated expecting prevalence of PFPS to be 30 % based on study of **Aldharman *et al.***⁽¹⁵⁾, using alpha (0.05), level of confidence (95%), and precision (3%), This analysis revealed a sample of 897 patients. Power analysis was done using Scalex SP calculator⁽¹⁶⁾.

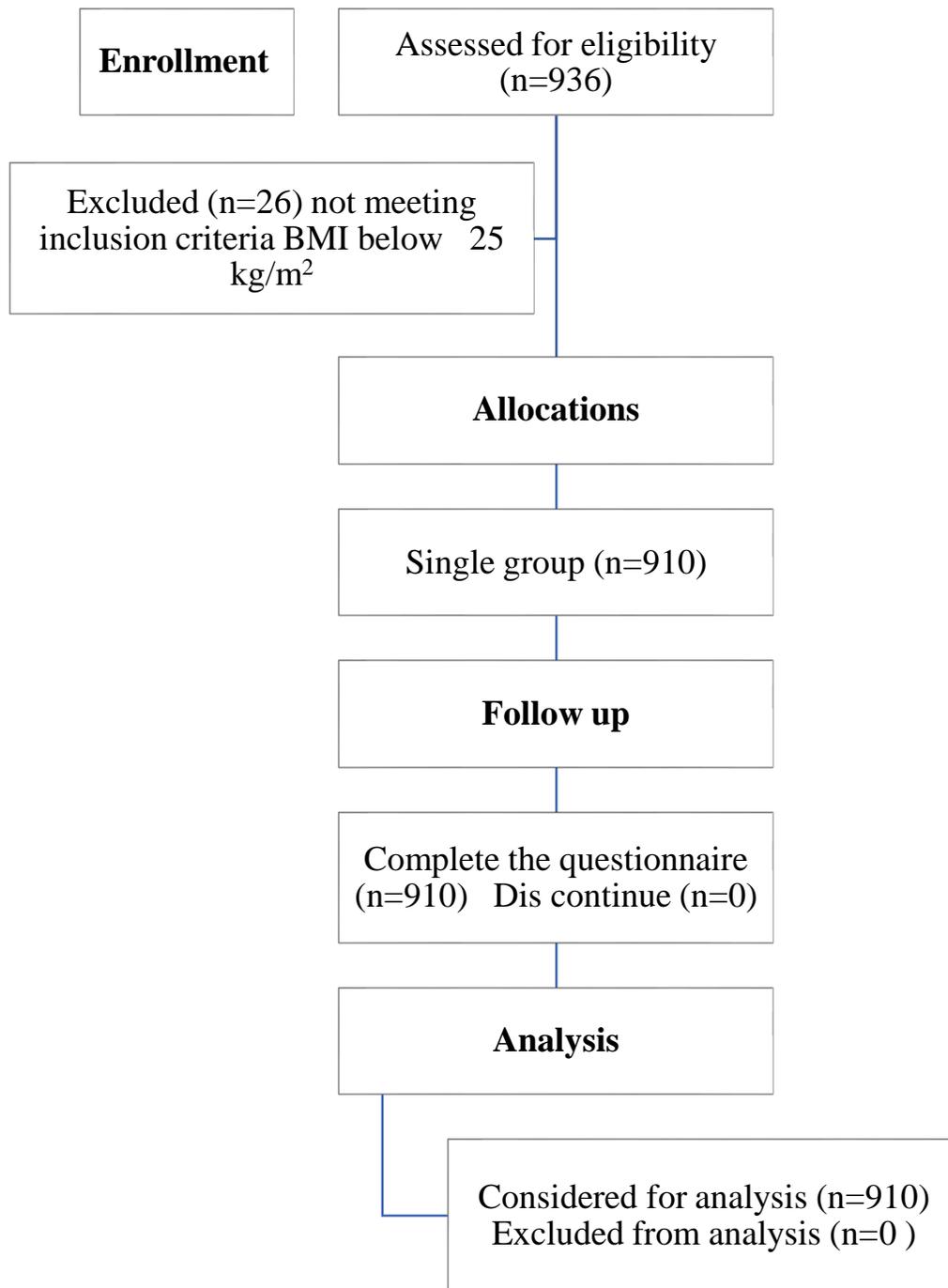


Figure 1: Flow chart of study subject

Procedures

In 2016, **Dey *et al.*** designed the Survey instrument for Natural history, Aetiology as well as Prevalence of Patellofemoral Pain Studies (SNAPPS), a self-report questionnaire, for collecting the data. To make the survey more accessible to a wider audience, they also made an Arabic version available on their website. In order to identify PFP cases in the community, a questionnaire was developed. The survey was meant to distinguish between community members who had and did not have PFP. Sections one through three made up the SNAPPS survey. The first part of the survey uses a single question to find those who have knee pain. The symptoms and signs of the knee disorder are discussed in section 2. In the third part, the challenges or pains that people often experience when engaging in particular activities due to knee problems are discussed. In the last part, a knee pain map is used to identify exactly where the pain is. The designers compared individuals with and without knee disorders, as well as those with soft-tissue injuries and PFP. Based on the score, the questionnaire's measuring qualities were good, encompassing only sections 2 and 4. It had a high level of sensitivity (>90%) and specificity⁽¹⁷⁾. A score of 6 or higher is considered PFP. Sections 1, 2, and 4 of the original SNAPPS questionnaire make up our online version. There were four parts to the first SNAPPS that **Dey *et al.*** created. Nevertheless, their studies have shown that removing section 3⁽¹⁷⁾ enhanced the questionnaire's measuring properties. Another possible reason for the low participation rate in our study was the questionnaire's excessive number of questions. We decided to eliminate section 3 from our online questionnaire after giving it some thought.

In the first part of the survey, participants were asked to give basic personal information including their age, gender, height, and weight. They were also asked to rate their level of pain or issues in the knee area within the past year. The participants were categorized as patients without knee pain if they respond "no" to the questionnaire. Participants moved on to the next two parts if they got a "yes" response. Section 2 and 4 scores were determined after all data have been collected. In section 2, there were 7 questions. The participants were given a score of either 0 or 1 for every question, depending on their answer⁽¹⁵⁾.

In the second part of the test, participant should expect a range of scores from 0 to 7. In Section 4, patients saw a knee joint image that labels the medial, lateral, as well as inferior patella portions. On each knee, a total of six points were marked. Each participant was asked to count the number of places on their knees where they

felt pain. Each region of pain that the participant chose were worth one point. The range of possible scores in section 4 is from 0 to 6. By combining their results from sections 2 and 4, we can see how everyone did in the end.

It was assumed that individuals who reported knee pain but did not have PFP have an overall score of 6 or lower. Any participant whose total score is 6 or higher was determined to have PFP⁽¹⁴⁾. A Google form poll was sent out over several social media channels, such as Telegram, WhatsApp, as well as Facebook. At the outset of the survey, we asked, "Is your age between 18-40?" to ensure that the study's eligibility criteria would be met by utilizing Google Forms' needed to proceed option. With a "yes" response, the participant was prompted to proceed with the questionnaire; a "no" response would result in the form's immediate submission.

Ethical considerations:

The study got approval from Cairo University's Ethical Committee for Physical Therapy (P.T.REC/012/004610). Informed agreement was given to all individuals on the 1st page prior to they filled out the questionnaire, and all data were maintained private and utilized only for scientific research. Involvement in this study was totally voluntary and elective. The Helsinki Declaration was followed throughout the study's conduct.

Statistical analysis:

Prior to being converted to SPSS version 23 (SPSS Inc. Chicago, Illinois, USA), the acquired data were initially input into an Excel file. The characteristics of the subjects were described using descriptive statistics. Chi-squared test was used to detect the associations between risk factors and the prevalence of patella-femoral and knee pain. We examined the overall sample prevalence of knee pain as well as the prevalence of PFP in the overall population of people who suffer from knee pain. The correlation between PFP prevalence as well as risk factors (gender, age, BMI, marital status, and occupation) was investigated using a chi-squared test. A statistically significant result was defined as $P \leq 0.05$.

RESULTS

The main purpose of this study was to find out the prevalence of patellofemoral and knee pain and their risk factors (including BMI, age, gender, marital state, and job) in Great Cairo obese population.

This study included 910 participants. Characteristics are presented in **Table 1**.

Table 1: Characteristics of all participants (N=910)

| Characteristics | Mean | Standard Deviation |
|--------------------------|-----------|--------------------|
| Age (year) | 27.3 | 8.05 |
| BMI (kg/m ²) | 31.2 | 5.6 |
| Gender; Male count (%) | 346 (38%) | |

BMI: body mass index

Prevalence of patellofemoral and knee pain in Great Cairo obese population:

Table (2) demonstrate that the prevalence of PFP in the current study was 42.4%, while it was 14% in knee pain.

Table (2): Prevalence of patellofemoral and knee pain in Great Cairo obese population (N=910)

| Categories | Count (Percentage) |
|---------------------|--------------------|
| No pain | 397 (43.6) |
| Patellofemoral pain | 386 (42.4) |
| Knee pain | 127 (14) |

Associations of risk factors (BMI, age, gender, marital state, and job) and prevalence of patellofemoral and knee pain:

Table (3) shows prevalence of PFP as well as knee pain in each category of risk factors. Chi-squared test revealed that all risk factors were significantly associated with prevalence of PFP and knee pain except gender that was insignificantly associated with PFP.

Table (3): Associations of risk factors (BMI, age, gender, marital state, and job) and prevalence of patellofemoral and knee pain (N=910)

| Risk factors | Categories | No pain | | Knee pain | | Test value (p) | PFP | | Test value (p) |
|---------------|---------------------|---------|-------|-----------|-------|-------------------|-------|-------|-------------------|
| | | Count | % | Count | % | | Count | % | |
| Gender | Male (n=346) | 140 | 40.5 | 60 | 17.3 | 5.85 (0.016*) | 146 | 42.2 | 0.55 (0.46) |
| | Female (n=564) | 257 | 45.5 | 67 | 11.9 | | 240 | 42.6 | |
| Marital state | Married (n=330) | 96 | 29.1 | 64 | 19.4 | 39.8 (<0.001*) | 170 | 51.5 | 42 (<0.001*) |
| | Single (n=553) | 294 | 53.2 | 57 | 10.3 | | 202 | 36.5 | |
| | Divorced (n=15) | 2 | 13.3 | 4 | 26.7 | | 9 | 60 | |
| | Widower (n=12) | 5 | 41.65 | 2 | 16.7 | | 5 | 41.65 | |
| Age (year) | 18-22 (n=382) | 200 | 52.35 | 45 | 11.75 | 27.7 (<0.001*) | 137 | 35.9 | 31.7 (<0.001*) |
| | 23-28 (n=159) | 80 | 50.3 | 18 | 11.3 | | 61 | 38.4 | |
| | 29-34 (n=137) | 51 | 37.25 | 15 | 10.95 | | 71 | 51.8 | |
| | 35-40 (n=232) | 66 | 28.45 | 49 | 21.15 | | 117 | 50.4 | |
| Job | Student (n=370) | 191 | 51.62 | 46 | 12.43 | 23.15 (0.017*) | 133 | 35.9 | 35 (<0.001*) |
| | Lawyer (n=26) | 7 | 26.92 | 3 | 11.53 | | 16 | 61.55 | |
| | Worker (n=11) | 4 | 36.4 | 2 | 18.1 | | 5 | 45.5 | |
| | Sales (n=9) | 3 | 33.33 | 2 | 22.22 | | 4 | 44.44 | |
| | Officer (n=79) | 24 | 30.4 | 16 | 20.3 | | 39 | 49.3 | |
| | Teacher (n=82) | 44 | 53.7 | 9 | 11 | | 29 | 35.3 | |
| | House worker (n=70) | 17 | 24.2 | 16 | 22.9 | | 37 | 52.9 | |
| | Unemployed (n=71) | 26 | 36.6 | 9 | 12.7 | | 36 | 50.7 | |
| | Free worker (n=46) | 19 | 41.3 | 8 | 17.4 | | 19 | 41.3 | |
| | Engineer (n=38) | 21 | 55.3 | 4 | 10.5 | | 13 | 34.2 | |
| | Doctor (n=78) | 32 | 41.02 | 9 | 11.54 | | 37 | 47.44 | |
| | Accountant (n=30) | 9 | 30 | 3 | 10 | | 18 | 60 | |
| BMI | 25-30 (n=472) | 227 | 48.1 | 54 | 11.4 | 13.8 (0.001*) | 191 | 40.5 | 13 (0.001*) |
| | 30-35 (270) | 120 | 44.4 | 41 | 15.2 | | 109 | 40.4 | |
| | >35 (168) | 50 | 29.8 | 32 | 19 | | 86 | 51.2 | |

(^a): association between risk factors and patellofemoral and no pain categories; (*): significant; n: number; p: probability value; BMI: body mass index; PFP: patellofemoral pain

DISCUSSION

Aims of the study included addressing the following questions:

1. What was the prevalence of PFP as well as knee pain in great Cairo obese population?
2. Was there association between body mass index, age, gender, marital state and job in PFP as well as knee pain in great Cairo obese population?

Many risk factors were measured and statistically analyzed in an effort to answer these questions, these factors were: -

- 1- Gender.
- 2- Marital state.
- 3- Age.
- 4- Body mass index.
- 5- Job.

An online version of the SNPTS-Survey was created using Google Forms. For this research, we used a social media platform for spreading a questionnaire. This study might thus include participants from a wide range of professions and backgrounds. Knee as well as PFP prevalence rates were determined.

The current study revealed the following findings: -

1. The prevalence of patella-femoral pain in this population was 42.4 % and prevalence of knee pain was 14%.
2. There was association between body mass index, age, marital state, job in PFP as well as knee pain in Great Cairo obese population.
3. There was no association between gender and PFP as well as knee pain in Great Cairo obese population.

A large number of musculoskeletal disorders, including PFP and knee pain, can cause great suffering and worse quality of life. To better understand the true disease burden on the population and develop more effective preventative and care strategies, it is crucial to conduct studies on the prevalence of PFP and knee pain⁽¹⁸⁾.

The purpose of the study was to collect data on the frequency of PFP and knee pain in the overall population of obese Egyptians and to identify risk factors for these conditions. The frequency of PFP and knee pain in the Egyptian population as a whole has never been studied on such a big scale before. By using SNAPPS questionnaire the current study revealed that all risk factors (age, gender, marital status, BMI, job) were significantly associated with prevalence of patellofemoral and knee pain except gender that was insignificantly associated with PFP. While **Xu et al.** observed no correlation between gender, age, or BMI as well as the prevalence of PFP in their entire

sample, our results show the opposite. Nevertheless, when it comes to gender, the two research are in agreement⁽¹⁴⁾.

1- patellofemoral pain prevalence and gender association:

A total of 42.4% of the population was determined to have PFP. In men, the prevalence of PFP was 42.2%, whereas in women, it was 42.6%. When contrasted to the findings of the study by **Aldharman et al.**⁽¹⁵⁾, which indicated a total prevalence of 30.3%, a prevalence of 31.4% within men, and a prevalence of 29.5% within females, the present prevalence is greater. We observed a greater prevalence in general in our study compared to the one reported by **Xu et al.**, where the general prevalence was 20.7%, PFP prevalence within males was 20.3%, while PFP prevalence within females was 21.2%⁽¹⁴⁾. Additionally, the total prevalence in this study was shown to be higher than that in the study by **Smith et al.**, which revealed a frequency of 22.7%⁽¹⁹⁾. In addition to genetic and environmental variables, this may be due to the fact that participants' ages as well as levels of activity varied. The diagnostic methods used and the demographics of the sample population may also cause prevalence rates to fluctuate.

Although there was no statistically significant difference between the sexes, the current study found a slightly greater prevalence of PFP among females (42.6 vs. 42.2%). A higher number of females than males have reported experiencing PFP⁽²⁰⁾. One possible explanation is that women's lower limb biomechanics differ from men's .

Knee pain prevalence:

While a previous study by **Nguyen et al.** indicated a prevalence of 8% for knee discomfort, this current study revealed that 14% of study participants had this condition⁽²¹⁾. However, a study conducted by **Chia et al.** revealed a prevalence of knee pain of 21.1%⁽²²⁾; our study reported a lower prevalence.

2- Marital state association:

Our research showed that the prevalence of PFP was 51.5% across married people and 36.5% across single people. Results showed that PFP was prevalent among both divorced and widowed people at 60% and 41.65%, respectively .

Researchers found that 19.4% of married people and 10.3% of single people suffer from knee pain. Among those who have been through a divorce, 26.7% reported knee pain, while 16.7% of those who have been widowed reported the same. This is identical to the findings of the **Aldharman et al.** study, which indicated that marital status, age 18–25, and age 26–35 were the best predictors of a greater PFP rate⁽¹⁵⁾. The study by **Cook et al.**, which examined the relationship between PFP and variables like age, gender, and marital status, came to a different conclusion⁽²³⁾.

3- Age:

The findings of our study indicate that the frequency of PFP was 35.9% among individuals aged 18 to 22 and 38.4% among those aged 23 to 28. The study revealed that the prevalence of PFP was 51.8% among individuals aged 29-34 and 50.4% among those aged 35-40. According to our research, the prevalence of knee pain was 11.75% among those in the 18–22 age range and 11.3% among those in the 23–28 age range. According to the findings, the prevalence of PFP was 10.95% in individuals aged 29 to 34 and 21.15% in those aged 35 to 40. Thus, we discovered that the age groups of 29 to 34 and 35 to 40 had greater rates of PFP and knee discomfort. This aspect was found to be in conflict with **Cook *et al.***'s study, who detected no relationship between PFP, age, or gender ⁽²³⁾. The investigation by **Crossley *et al.*** revealed similar results, showing a correlation between the prevalence of PFP and ages under 40 ⁽²⁴⁾.

4- BMI:

BMI was divided into three categories: -First category ranged from 25-30 (kg/m²) the prevalence of PFP in this category was found to be 40.5% and knee pain was 11.4%. The second category (30-35) percentages were 15.2% for knee pain and 40.4% for PFP. Third category (>35) percentages were 19% for knee pain and 51.2% for PFP. In this study we found that subjects with BMI more than 35 (kg/m²) was detected to be predicting a higher rate of PFP as well as knee pain. These findings differ from those of the study by **Xu *et al.***, which indicated that, with the exception of gender, there was no correlation between age, BMI, or prevalence of PFP in the total sample ⁽¹⁴⁾. In general, our results were in contradiction to the factors linked to the frequency of PFP, which have been the subject of multiple investigations. No significant associations have been identified when certain characteristics including height, mass, age, and sex are evaluated ⁽²⁵⁾.

5- Job:

According to our research, there was a direct association between employment and patellofemoral pain and knee pain. Our research revealed that the percentage of patellofemoral pain varied depending on the subject's occupation. For example, the percentage was found to be 35.9% for students, 61.55% for lawyers, 45.5% for workers, 44.44% for salesman, 49.3% for officer workers, 35.3% for teachers, and 52.9% for house workers. The percentage of patellofemoral pain was also found to be 50.7% for unemployed participants, 41.3% for free workers, 34.2% for engineers, 47.44 percent for doctors, and 60% for accountants.

The number of people with knee pain differed based on their work, according to our findings. For instance, it was discovered that the percentages for students were 12.43%, lawyers, 18.1%, workers, 22.22%, salesman, 20.3%,

officer workers, 11% for teachers, and houseworkers, 22.9%. Additionally, it was discovered that 12.7% of participants who were jobless, 17.4% of free workers, 10.5% of engineers, 11.54% of doctors, and 10% of accountants had knee pain. Consistent with these results, the study ⁽²⁶⁾ in which the prevalence of PFP was high in workers. **Pereira *et al.*** published the results of an additional investigation. Out of the twenty workers who were exposed to the risk of PFPS, six males (30%) were affected ⁽²⁷⁾. While 63.54% of Lahore students reported mild or no symptoms of PFPS, 26.74% reported moderate symptoms of anterior knee joint pain, while 9.72% reported severe symptoms, our study's findings were consistent with those results, which were found by **Ali *et al.*** ⁽²⁸⁾. Our findings are in line with those of research by **Youssef *et al.*** ⁽²⁹⁾ that found that young, active medical students at Cairo University were more likely to experience PFP in females than males .

Although the prognosis for PFPS is generally favorable, the condition, if neglected, can cause significant pain and mobility limitations as well as osteoarthritis of the patella and femur as a result of inadequate patella tracking ⁽¹⁸⁾.

Patients are able live more active lives when they receive treatment that is evidence-based and are able to reduce pain. The inability to determine the incidence or draw a causal conclusion were the limitations of our investigation, which are common to most cross-sectional studies. One of the key limitations is the absence of a universally accepted definition of PFP. Furthermore, due to the potential for under- or excessive representation of the population brought about by convenience sampling, we recommend that future studies employ other study designs, including a retrospective study, to accurately quantify PFP and its associated characteristics.

We limited the participants to those between the ages of 18 and 40, which might have an impact on the findings. In populations that are younger or older than the specified age range, the prevalence might be different. Some children might not be able to use cell phones, and people over 40 could get knee osteoarthritis. Because of this, the study's age restriction was set at 18–40 years old.

We should raise awareness and educate people about PFP as well as knee pain so they may learn how to prevent it, treat it at home, and realize when to see a doctor. Promoting the role of media as well as social community activities about PFP and knee problems could help attain the goal of population health education.

There are a few limitations on this study. Without a universally accepted definition of PFP, there are multiple limitations. There are limitations to both the clinical evaluation and the self-report questionnaire. For an online survey of this size, the questions are adequate. No community-based evaluation of the diagnostic accuracy of the SNAPPS was conducted for this study. The above-mentioned concerns about the questionnaire's potential to

miss certain instances or confuse other knee disorders as PFP are well-founded⁽¹⁴⁾.

CONCLUSION

The great Cairo Egyptian populace that is obese has a relatively significant prevalence of PFP as well as knee problems. A greater prevalence of PFP as well as knee pain was seen in those between 29 and 40 years in comparison with other younger age groups.

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No source of funding was utilized for this study.

Conflict of interest

No potential conflicts of interest exist for the authors.

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