Burden of Pelvic Girdle Pain During Pregnancy Among Women Attending Ante-Natal Clinic, Ethiopia: A Cross-Sectional Study

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Abstract

Background: Pelvic girdle pain (PGP) is a commonly reported maternal morbidity that negatively impacts the well-being of women during pregnancy and extends long term into the post-partum period. The burden of maternal morbidity; including pregnancy-related PGP; has been overlooked in Ethiopia to date. This study aimed to determine the prevalence and identify factors associated with pelvic girdle pain during pregnancy in North West Ethiopia.

Methods: A hospital-based cross-sectional study was conducted among pregnant women visiting the antenatal care clinic in Obstetrics ‘outpatient department at the University of Gondar comprehensive specialized hospital in Gondar. Data were collected by interview method using structured questionnaires, patient medical record reviews, and physical measurements. Univariate and multivariable logistic regression model analyses were used to identify factors associated with PGP.

Results: A total of 424 participants with gestational ages ranging from 6 to 39 weeks participated in this study. The age of the study participants ranged from 18 to 44 years with a mean age of (27 ±4.6 years). The overall cumulative prevalence of pelvic girdle pain among pregnant women was 103 (24.3%), 95% CI (20.3, 28.8). The major associated factors with pelvic girdle pain were previous history of pelvic girdle pain (AOR 16.08; 95% CI, 8.47-30.51), previous history of back pain (AOR 1.66; 95% CI, 1.5-4.24) and having children (AOR 1.42; 95% CI, 1.29-3.76).

Conclusion: One-quarter of pregnant Ethiopian women reported pelvic girdle pain. Many respondents endured pain on multiple occasions and association with the previous history of PGP might be an episode of relapse. PGP must be considered a major pregnancy-related morbidity, and progress in the intervention of PGP is vital to enhance the quality of life in this population.

Background

Maternal well-being has gained focus after global progress in maternal mortality reduction, and PGP has garnered substantial interest by pelvic health professionals worldwide [1, 2]. According to the World Health Organization, maternal morbidity is defined as “any health condition attributed to and/or is aggravated by pregnancy and parturition that negatively impacts the women wellbeing”[3]. Maternal adaptation of musculoskeletal structures during pregnancy results in pregnancy-related musculoskeletal problems. However, most of them are not life-threatening conditions and are overlooked in LMICs with higher maternal mortality rate (MMR), disorders like pelvic girdle pain (PGP), low back pain (LBP), hip pain, and sacroiliac pain can impact women's wellbeing. Even minor ailments can cause major concerns in this population [4, 5].

In Ethiopia, 80% of women reside in rural and women often experience physical hardship, such as carrying loads, agricultural labor, and domestic household work, in addition to raising children. On most occasions, Ethiopian women are involved in physical hardships during pregnancy. Like many other African countries, maternal morbidity and mortality are still unacceptably high, and maternal health is
one of the top priorities in the Ethiopian national agenda. The global maternal mortality rate (MMR) 2015 is 216, the MMR of Sub-Saharan Africa (SSA) is 546, and Ethiopia is among those SSA countries with high MMR, 412. Research has shown an association between MMR and morbidity, where morbidity rates are much higher in countries with higher MMR. The government of Ethiopia (MOH, 2015) 2015-16 in the Health Sector Transformation Plan (HSTP) prioritized maternal health and well-being to promote women's health in the country. The UNFPA report on maternal health in Africa estimated that for every woman who dies, 20–30 women suffer short-or-long term disabilities, including chronic pain. According to the EDHS 2016 report, only 17% of women attend post-natal care, which emphasizes the importance of estimating the burden of morbidity in this population during the ante-natal period [6–9].

Previous studies have shown that about 33–50% of pregnant women report PGP before 20 weeks of gestation and that the prevalence may reach 60–70% in late pregnancy [10–12]. The Reported prevalence rates of PPGP in Western countries are 23.6%, 22.6%, 36.2%, 14.2%, 31.2%, and 34% in various prospective studies, and 42.4% and 9.8% in retrospective studies [5, 13–15]. The average reported prevalence of pregnancy-related pelvic girdle pain is 45.3% (range, 3.9–89.9%) in 28 studies [16, 17]. Studies have shown variation in the prevalence, severity, and factors concerning pregnancy, the attitude of women, socio-economic status, societal role, ethnicity, physical demand, cultural beliefs, and education status might influence how pregnancy-related PGP is perceived. Nevertheless, fear of movement, disability, negative psychological effects, history of LBP, age, parity, exercise levels, work history, job satisfaction, and education levels have been reported to be associated with PPGP in many countries [13, 15, 17–21]. There is an extensive reporting of maternal mortality and severe acute maternal morbidity in Ethiopia [22, 23], but the burden of chronic painful conditions including PPGP has not gained attention, our extensive search revealed scarce published regional works reporting the prevalence of morbidity-related conditions during pregnancy including PPGP in the sub-Saharan region, and none were found in Ethiopia.

Lack of awareness of the impairment caused by musculoskeletal disorders related to pregnancy can result in poor management of pregnant women. Most studies on pregnancy-related PGP have been conducted in developed countries [13, 15, 17], while these conditions are often ignored in developing countries. Hence, this study aimed to determine the prevalence and identify factors associated with PPGP among pregnant women in North West Ethiopia.

**Methods**

**Study design, setting, and participants**

A hospital-based cross-sectional study was conducted from January to June 2019 among pregnant women attending antenatal care clinic (ANC) in Obstetrics ‘outpatient department at the University of Gondar comprehensive specialized hospital (UoGCSH) in Gondar, Northwest Ethiopia, situated in the northern part of Ethiopia in Amhara national regional state, 747 km from the capital city of Addis Ababa at 12° 45n or thlatitude and 37°.45east longitudes with an elevation of 2,706 meters (8,878 ft)
above sea level. Based on the 2016 population estimates of the Gondar City Administration Bureau, Gondar had total inhabitants of 335,000, among which 182000 (52%) were women. The dominant means of livelihood is agriculture. About 77% of the rural mothers have to travel near to 20km to get to public health services.

The Ethiopian public health system offers all women free health services during pregnancy. The University of Gondar Comprehensive Specialized Hospital provides tertiary care to the population of Gondar and its neighboring states, and most of the patients come from the lower socioeconomic strata. The Hospital has an antenatal clinic, which delivers antenatal care services every day. Annually, about 20,000 pregnant mothers visit the hospital for ANC services. The study population comprised of all pregnant mothers aged between 18 and 44 years, during any trimester of pregnancy those who were attending antenatal care during the data collection period at the ANC clinic, UoGCSH were considered. Pregnant women medically diagnosed with painful visceral pathologies, current low back pain, tuberculosis or syphilitic lesions of pubis, urinary tract infections, femoral vessel diseases, pre-eclampsia, eclampsia, serious intellectual disorders and recent trauma in the pelvic or low back region were excluded.

Sample size determination and Sampling procedure

A sample size of 442 was calculated using a single population proportion formula [24] based on the assumptions; 95% confidence interval, 50% prevalence, 5% precision, 15% non-response, and contingencies. Systematic random sampling was used to select the participants based on the chart register of the day. On average, about 50-60 mothers visit the ANC care unit at UoGSCH per day. Based on the previous year ANC records the estimated number of visits by pregnant women during the study period would be 4040 and the derived $K^{th}$ was 9. The first participant was selected between 1 and $K^{th}$ by using the lottery method. The procedure was repeated until the estimated eligible sample size was attained.

Study procedures

The study was conducted after obtaining ethical approval from the Institutional Review Board (IRB), CMHS, University of Gondar (Ref no; SOM/056/7/2019). Permissions were obtained from regional public health institutes and the authorities of the Department of Obstetrics and Gynaecology, UoGCSH, prior to the study. Before enrollment, the pregnant women were informed about the study, its objectives, and its importance. Written consent was obtained from the data collectors. A structured self-administered questionnaire (Additional file 1) was adopted from the pelvic girdle pain questionnaire [25] and other related literature [26-28]. To maintain consistency, the questionnaire was first translated from English to Amharic (the native language of the study area) and re-translated into English by professional translators and senior physiotherapists to check for the consistency of the questions and corrections were made accordingly. Four junior physiotherapist data collectors and two senior physiotherapist supervisors were selected. Before data collection, one-day intensive training on the objectives of the study, data collection procedures, and the confidentiality of information was given to data collectors and the supervisor by the
primary investigator (MG). The questionnaire was also piloted on 5% (n = 22) of the total sample from the Maraki Health center, to evaluate the acceptability and applicability of the procedures and the questionnaire. Modifications and corrections of the measurement procedures were made based on analyses of pre-test data. The Cronbach's alpha score was 0.82. Weight was measured using a floor checking weighing scale (Adam Equipment GFK 1320, Philips) with participants standing without shoes and wearing light clothing and recorded to the nearest 0.5kg. Height was measured using a stadiometer while standing upright with the head in Seca 213 portable Stadiometer height and recorded with an approximation of 1 cm. The data collection process was closely monitored by the principal investigator (MG) and the supervisors throughout the data collection period.

Definitions

PPGP was defined as ‘recurrent pain’ or continuous pain’ for at least a week between the posterior iliac crest and gluteal folds, particularly in the vicinity of the sacroiliac joints with/without pubic symphysis pain during the current pregnancy. A pregnant woman was considered to be suffering from PPGP if she responded “yes” to the specific question regarding localization of pain, which also included identifying the region on a flashcard shown during the interview.

Physical activity: Was categorized as 'Yes' or No based on the response to three questions: 1) Do you exercise regularly now? 2) If you exercise regularly, how many days a week do you exercise? 3) If you exercise regularly, how many minutes a day, on average, do you exercise? For question no, 1 the response alternatives were 'yes' or 'no' and for question no 2 the respondent has to fill the number of days/week and for question no 3 the respondent had to fill the average minutes of exercising per day. A respondent is defined to be physically active based on ACOG recommendations (1. ‘yes’, 2. ≥ 3 days, 3. ≥ 20 min).

Self-rated health: The pregnant women were asked to self-rate their health status now and before pregnancy. A '5'category responses were used to differentiate the responses arranged from very good through poor.

Statistics

Data were entered using EpilInfo software version 7.1 and exported to the IBM Statistical Package for Social Sciences (SPSS) version 23 for the window for further analysis. Data entry with the original data was done by the data collector and the main investigator (MG) supervising each other to enhance correctness. Besides, the data was checked by two other researchers (BJ and SG) for completeness, accuracy, and clarity. Descriptive statistics, like frequencies and proportions, were computed, and the binary logistic regression model was used to identify significant variables. Variables with a $p$-value of less than 0.2 in the bivariable logistic regression analysis were entered into the multivariable logistic regression analysis. Both crude odds ratio (COR) and adjusted odds ratio (AOR) with the corresponding 95% confidence intervals were calculated to show the strength of the associations. Finally, a $p$-value of less than 0.05 in the multivariable logistic regression analysis was used to identify variables significantly associated with pelvic girdle pain. Potential confounding variables were entered into the model as
covariates, and variability in the association was examined. When clear subgroups per category existed in the data, significance testing (Pearson $\chi^2$) and logistic regression model were performed for appropriately sized subgroups. Interaction terms were used to examine the potential association between independent variables and the dependent variable. Finally, the research was reported in adherence to the STROBE guidelines (Additional file 2).

Results

Sociodemographic characteristics of pregnant women

A total of 424 participants with gestational ages ranging from 6 to 39 weeks were included in this study. This is a 95.9% response rate and beyond the power calculated sample size. The reasons for non-responses were no time, not interested, and refusal husband to take consent. The age of the study participants ranged from 18 to 44 years with a mean age of (27 ± 4.6 years). Near above two-thirds of the pregnant women, 306 (72.2%) were within the age of 20 years. Most of them reported their religious affiliation as orthodox Christians (85.8%), 94.6% were legally married, more than half (52.6%) of the women had children, and almost all of them (99.5%) reported no smoking habits. Nearly half of them (48.1) were unemployed, only one in five women had secondary level education and above, and very few (14.2%) practiced physical activity according to ACOG guidelines. The participant's socio-demographic characteristics of pregnant women are presented in (Table 1).
Table 1
Socio-demographic characteristics of pregnant women who attained antenatal care clinic at Gondar, University Specialized Referral Hospital, Ethiopia (n = 424)

| Variables                      | Categories                                | n   | %   |
|--------------------------------|-------------------------------------------|-----|-----|
| Age in years                   | Less than 20                              | 36  | 8.5 |
| (mean age (27 ± 4.6)           | 21–30                                     | 306 | 72.2|
|                                | Greater than 30                           | 82  | 19.3|
| Residence                      | Urban                                     | 364 | 85.8|
|                                | Rural                                     | 60  | 14.2|
| Marital status                 | Married                                   | 401 | 94.6|
|                                | relationship but not married               | 18  | 4.2 |
|                                | Others +                                  | 5   | 1.2 |
| Religion                       | Orthodox Christian                        | 362 | 85.4|
|                                | Muslims                                   | 45  | 10.6|
|                                | Others ++                                 | 17  | 4.0 |
| Occupation                     | Homemaker                                 | 204 | 48.1|
|                                | Farmer                                    | 13  | 3.1 |
|                                | Civil servant                             | 98  | 23.1|
|                                | Merchant                                  | 51  | 12.0|
|                                | Unemployed                                | 17  | 4.0 |
|                                | Others*                                   | 41  | 9.7 |
| work status in week/hour       | None                                      | 10  | 2.4 |
|                                | 0–20 hours                                | 172 | 40.6|
|                                | 20–40 hours                               | 124 | 29.2|
|                                | more than 40 hours                        | 118 | 27.8|
| work type                     | very heavy                                | 8   | 1.9 |
|                                | Heavy                                     | 52  | 2.3 |
|                                | Fair                                      | 79  | 42.2|

+-divorced and singles; ++-protestant, catholic;*-students and daily labours
| Variables                  | Categories                  | n  | %    |
|----------------------------|-----------------------------|----|------|
| Light                      | 164                         |    | 38.7 |
| Very light                 | 21                          |    | 5.0  |
| work satisfaction          | very bad                    | 6  | 1.4  |
|                            | Bad                         | 13 | 3.1  |
|                            | Fair                        | 60 | 14.2 |
|                            | Good                        | 271| 63.9 |
|                            | Very good                   | 74 | 17.5 |
| Level of education         | No formal school            | 93 | 21.9 |
|                            | Primary school              | 90 | 21.2 |
|                            | Secondary school            | 82 | 19.3 |
|                            | Diploma                     | 87 | 20.5 |
|                            | Degree and above            | 72 | 17.1 |
| Income (ETB/month)         | < 1000                      | 122| 28.8 |
|                            | 1000–2000                   | 91 | 21.5 |
|                            | 2001–3000                   | 82 | 19.3 |
|                            | > 3000                      | 129| 30.4 |
| Smoking habit              | Never                       | 422| 99.5 |
|                            | Past smoker                 | 1  | 0.2  |
|                            | Current smoker              | 1  | 0.2  |
| Drinking alcohol habit     | Never                       | 309| 72.9 |
|                            | Past alcoholic              | 30 | 7.1  |
|                            | Current alcoholic           | 85 | 20.0 |
| Physical activity          | No                          | 329| 77.8 |
|                            | Yes                         | 95 | 14.2 |
| Self-rated health status   | very good                   | 219| 51.7 |
|                            | Quite good                  | 122| 28.8 |

+-divorced and singles; ++-protestant, catholic;*-students and daily labours
| Variables | Categories     | n   | %   |
|-----------|----------------|-----|-----|
|           | Fair           | 45  | 10.6|
|           | Quite poor     | 28  | 6.6 |
|           | Poor           | 10  | 2.4 |

+-divorced and singles; ++-protestant, catholic;*-students and daily labours

**Obstetric-related characteristics**

About half (47.4%) of the women were in their first pregnancy. Among the total study participant's 94.1% of them had planned pregnancy, and more than one third, 33.3% of them were in their second trimester (within the gestational weeks of 13 and 28). Nearly, one in five (22.4%) pregnant women had two or more gravidity; about 12.03% of the study participants had experienced abortion in their previous pregnancies and 11.3% reported taking one or more medications for different conditions. Among the total study participant's 272 (64.2%) and 69 (16.3%) reported having a history of low back pain and pelvic girdle pain during their previous pregnancies, respectively. Table 2 shows the obstetric related characteristics of pregnant women.
Table 2
Obstetrics related characteristics of pregnant women who attained antenatal care services at Gondar, University Specialized Referral Hospital, Ethiopia (n = 424)

| Variables                          | Categories                  | n    | (%)  |
|-----------------------------------|-----------------------------|------|------|
| Trimesters                        | 1st trimester(1-12wks)      | 3    | 0.7  |
| (mean gestational week(31.52 ± 7.18) | 2nd trimester(13-28wks)    | 141  | 33.3 |
|                                   | 3rd trimester(29-40wks)     | 280  | 66.0 |
| Number of previous Pregnancies    | No                          | 201  | 47.4 |
|                                   | One                         | 100  | 23.58|
|                                   | Two                         | 95   | 22.4 |
|                                   | Three and above             | 28   | 6.62 |
| Do you have children?             | No                          | 201  | 47.4 |
|                                   | Yes                         | 223  | 52.6 |
| History of abortion               | No                          | 373  | 89.97|
|                                   | Yes                         | 51   | 12.03|
| Pattern of current pregnancy      | Planned                     | 399  | 94.1 |
|                                   | Unplanned                   | 25   | 5.90 |
| Taking medication                 | No                          | 376  | 88.7 |
|                                   | Yes                         | 48   | 11.3 |
| History of back pain              | No                          | 152  | 35.8 |
|                                   | Yes                         | 272  | 64.2 |
| History of PPGP                   | No                          | 355  | 83.7 |
|                                   | Yes                         | 69   | 16.3 |

PPGP-pregnancy related pelvic girdle pain; wk-weeks

Pelvic girdle pain
One hundred and three (n = 103 (24.3%): 95% CI (20.3, 28.8) pregnant women reported of experiencing pelvic girdle pain during the current pregnancy. The prevalence of pelvic girdle pain was significantly higher (61.2%, n = 63) among women who had children, in those who were in the aged range between 21
and 30 years (68.9%, n = 71). Among 103 pregnant mothers who reported to have endured PGP, (81.6%, n = 84) reported frequent pain. The burden of pelvic girdle pain was higher among urban dwellers 87(84.5%) and those women 85 (82.5%) who did not report to practice a recommended level of physical activity. Most of the women (67.3%, n = 69) who were in their third trimester reported PGP in the current pregnancy. The prevalence and distribution of pelvic girdle pain among pregnant women are shown in Table 3.
Table 3
Burden of pelvic girdle pain among pregnant women at Gondar, University Specialized Referral Hospital, Ethiopia (n = 424)

| Variables                      | Categories                          | Pelvic girdle pain |
|--------------------------------|-------------------------------------|--------------------|
|                                |                                     | No (%)  | Yes (%) |
| Age in years (mean age (27 ± 4.6) | Less than 20                      | 30(9.3) | 6(5.8) |
|                                | 21–30                               | 235(73.2) | 71(68.9) |
|                                | Greater than 30                     | 56(17.4) | 26(25.2) |
| Residence                      | Urban                               | 277(86.3) | 87(84.5) |
|                                | Rural                               | 44(13.7) | 16(15.5) |
| Marital status                 | Married                             | 302(94.1) | 99(96.1) |
|                                | relationship but not married        | 14(4.4)  | 4(3.9)  |
|                                | Others +                            | 5(1.5)   | 0(0.0)  |
| Religion                       | Orthodox Christian                  | 274(85.4) | 88(85.4) |
|                                | Muslims                             | 32(10.0) | 13(12.6) |
|                                | Others ++                           | 15(4.6)  | 2(2.0)  |
| Occupation                     | Homemaker                           | 156(48.6) | 48(46.6) |
|                                | Farmer                              | 9(2.8)   | 4(3.9)  |
|                                | Civil servant                       | 73(22.7) | 25(24.3) |
|                                | Merchant                            | 35(10.9) | 16(15.5) |
|                                | Unemployed                          | 15(4.6)  | 2(2.0)  |
|                                | Others*                             | 33(10.3) | 8(7.8)  |
| Work status in week/hour       | None                                | 8(2.5)   | 2(1.9)  |
|                                | 0–20 hours                          | 137(42.7) | 35(34.0) |
|                                | 20–40 hours                         | 89(27.7) | 35(34.0) |
|                                | more than 40 hours                  | 87(27.1) | 31(30.1) |
| Work type                      | very heavy                          | 5(1.6)   | 3(2.9)  |
|                                | Heavy                               | 30(9.3)  | 22(21.4) |
|                                | Fair                                | 142(44.2)| 37(35.9) |
|                                | Light                               | 126(39.3)| 38(36.9) |
|                                | Very light                          | 18(5.6)  | 3(2.9)  |
| Work satisfaction              | very bad                            | 3(0.9)   | 3(2.9)  |
|                                | Bad                                 | 7(9.8)   | 6(5.8)  |
|                                | Fair                                | 41(12.8)| 19(18.4) |
|                                | Good                                | 212(66.0)| 59(57.3) |
|                                | Very good                           | 58(18.1)| 16(15.5) |
| Level of education             | No formal school                    | 69(21.5) | 24(23.3) |
|                                | Primary school                      | 72(22.4) | 18(17.5) |
|                                | Secondary school                    | 59(18.4) | 23(22.3) |
|                                | Diploma                             | 70(21.8) | 17(16.5) |
|                                | Degree and above                    | 51(15.9) | 21(20.4) |
| Income (ETB/month)             | < 1000                              | 95(29.6) | 27(26.2) |
|                                | 1000–2000                           | 71(22.1) | 20(19.4) |
|                                | 2001–3000                           | 65(20.2) | 17(16.5) |
|                                | > 3000                              | 90(28.0) | 39(37.9) |
| Smoking habit                  | Never                               | 321(100)| 101(98.01)|
|                                | Past smoker                         | 0(0.0)   | 1(1.0)  |
|                                | Current smoker                      | 0(0.0)   | 1(1.0)  |
| Drinking alcohol habit         | Never                               | 242(75.4)| 67(65.0) |
|                                | Past alcoholic                      | 19(5.9)  | 11(10.7) |
|                                | Current alcoholic                   | 60(18.7) | 25(24.3) |
| Physical exercise              | No                                  | 244(76.0)| 85(82.5) |
|                                | Yes                                 | 77(24.0)| 18(17.5) |
| Self-rated health status       | Very good                           | 178(55.5)| 41(39.8) |
|                                | Quite good                          | 90(28.0) | 32(31.1) |

ETB - Ethiopian birr, PPGP - Pregnancy-related pelvic pain
Regression analysis

In the univariate regression analyses, pelvic girdle pain was significantly (p < 0.20) associated with age, previous history of PPGP, previous history of back pain, current health status, physical exercise, and the number of children. Multivariate testing revealed that previous history of PPGP, previous history of back pain, and the number of children was significantly associated when adjusting for the other included variables. Table 4 shows the association between socio-demographic variables, obstetric and pregnancy-related variables, and pelvic girdle pain among the study participants. A previous history of PGP significantly increased the odds of PGP in current pregnancy by almost 16 times (AOR 16.08; 95% CI, 8.47–30.51). The model also showed that women reporting a history of back pain were more likely (AOR 1.66; 95% CI, 1.5–4.24) to have PGP. The adjusted odds of pelvic girdle pain were 1.42 times higher among pregnant women who had children as compared to women who had no child (AOR 1.42; 95% CI, 1.29–3.76).

| Variables                  | Categories | Pelvic girdle pain |
|----------------------------|------------|--------------------|
|                            |            | No (%)             | Yes (%)            |
|                            | Fair       | 29(9.0)            | 16(15.5)           |
|                            | Quite poor | 19(5.9)            | 9(8.7)             |
|                            | Poor       | 5(1.6)             | 5(4.9)             |
| Number of previous Pregnancies |            |                    |                    |
| No                         | 161(50.2)  | 40(38.8)           |
| One                        | 72(22.4)   | 34(33.0)           |
| Two                        | 73(22.7)   | 21(20.4)           |
| Three and above            | 15(4.7)    | 8(7.8)             |
| Do you have children?      | No         | 161(50.2)          | 40(38.8)           |
|                            | Yes        | 160(49.8)          | 63(61.2)           |
| Taking medication          | No         | 15(88.2)           | 33(63.5)           |
|                            | Yes        | 2(11.8)            | 19(36.5)           |
| History of back pain       | No         | 124(38.6)          | 28(27.2)           |
|                            | Yes        | 197(61.4)          | 75(72.8)           |
| History of PPGP            | No         | 304(94.7)          | 51(49.5)           |
|                            | Yes        | 17(5.3)            | 52(50.5)           |

ETB- Ethiopian birr, PPGP- Pregnancy-related pelvic pain
Table 4
Factors associated with pelvic girdle pain (PGP) pregnant women at Gondar, University Specialized Referral Hospital, Ethiopia (n = 424)

| Variables               | Categories | PGP Yes | PGP No | Univariate COR (95%CI) | Multivariate AOR (95%CI) |
|-------------------------|------------|---------|--------|------------------------|--------------------------|
| Age                     | ≤ 20       | 6       | 30     | 2.3(0.86–6.26)*        | 1.87(0.54–6.53)          |
|                         | 21–30      | 71      | 235    | 1.54(0.9–2.62)*        | 1.38(0.69–2.77)          |
|                         | > 30       | 26      | 56     | 1 ref                  | 1 ref                    |
| Previous history of PPGP| No         | 51      | 304    | 1 ref                  | 1 ref                    |
|                         | Yes        | 52      | 17     | 18.2(9.78–33.9)*       | 16.08(8.47–30.5)**       |
| Previous history of LBP | No         | 32      | 124    | 1 ref                  | 1 ref                    |
|                         | Yes        | 75      | 197    | 1.68(1.04–2.75)*       | 1.66(1.5–4.24)**         |
| Self-rated health status| Very good  | 41      | 178    | 4.3(1.2–15.6)*         | 0.31(0.02–4.6)           |
|                         | Quite good | 32      | 90     | 2.8(0.76–10.36)*       | 1.24(0.08–19.8)          |
|                         | Fair       | 16      | 29     | 1.8(0.45–7.2)          | 0.32(0.02–5.72)          |
|                         | Quite poor | 9       | 19     | 2.1(0.48–9.19)         | 1.84(0.11–29.5)          |
|                         | Poor       | 5       | 5      | 1 ref                  | 1 ref                    |
| Physical activity       | No         | 40      | 161    | 1.5(0.84–2.63)*        | 1.6(0.81–3.17)           |
|                         | Yes        | 43      | 160    | 1 ref                  | 1 ref                    |
| Having children         | No         | 40      | 161    | 1 ref                  | 1 ref                    |
|                         | Yes        | 63      | 160    | 1.58(1.1–2.49)*        | 1.42(1.29–3.76)**        |

*variables significant with p-value < 0.2; ** variables significant with p-value ≤ 0.05, 1 = reference category; COR crude odds ratio, AOR adjusted odds ratio, CI confidence interval, PPGP Pregnancy-related pelvic girdle pain, LBP Low back pain

Discussion

Pregnancy-related pelvic girdle pain is prevalent among Ethiopian pregnant women, and women who had a history of PGP were more likely to experience a relapse. PPGP significantly affects the role of being a mother, experience of pregnancy, family responsibility, societal role, and quality of life. Hence, this pregnancy-related conditions must be considered as one of the major public health problems, especially in LMICs with high maternal mortality and severe acute maternal morbidity. The findings of this study showed that the overall prevalence of pelvic girdle pain among pregnant women was 24.3% with 95% CI (20.3–28.8). History of PGP, history of back pain, and women with/have one or more children were significant predictors of PGP. PGP was highly prevalent (67.3%) among women in their third trimester (29–41 weeks) of the gestational weeks in the present study due to the overweight causes stress on the back and pelvic bones, an undue stretch of the pelvic soft tissue structure, and biomechanical changes that occur during the pregnancy [29].

Further, most of the urban-dwelling women in this study reported PGP versus rural women. The perception and reporting of physical symptoms such as pain sometimes depend on rurality and socioeconomic status. Rural women in Ethiopia might have higher pain tolerance as they are employed in farms; hardship laborer and would have experienced pain on several occasions. On the other hand, the attitude of low tolerance of pain and loss of qualitative life among urban women might be reasons for the difference in the prevalence. The prevalence of pelvic girdle pain found in the current study is comparable with the results of the studies done in Australia (23%) [30], India (18.5%) [31], Iran (28.0%) [19] and another hospital-based cross-sectional study done India (29.9%) [28]. However, the reported prevalence of pregnancy-related PGP in our study was found to be lower (24.3%) compared to studies in
developed countries (45–86%) [13, 16, 18, 32, 33] and the studies conducted in Indian tertiary care hospital (65%)(26) and Nepal (34%) [34]. The variation might be due to the difference in study settings, socio-economic status, level of education, and parity. Furthermore, the difference in maternal characteristics such as; most of the pregnant mothers of this study being in their third trimester (when the PPGP symptom seems to peak), with a mean gestation of 31 weeks, in contrast, most of the respondents in the reported studies who were in the second trimester, the gestational weeks of 16–40 weeks and there is vast variation in the outcome measures for e.g. some studies used self-report measures, such as pain location drawings and questionnaires, while others added physical examination to the self-reported measures to confirm the classification of PPGP like posterior pelvic pain provocation test, Patrick's Faber test, palpation of the long dorsal sacroiliac joint ligament, Gaenslen's test, distraction, compression, and Menell's tests [15, 26, 34]. Palpation of symphysis and modified Trendelenburg's test of the pelvic girdle were used to assess PGP and some of the studies were used modified Oswestry disability index, pelvic girdle pain questionnaire, pain numbering scan and visual analogues scale to assess pain [15, 18, 26, 31].

However, the prevalence of this study is higher than the studies conducted in Netherland(7.3%)(15). This difference observed in the prevalence rate of PGP could be due to the difference in study design, gestational week, and the study participant's characteristics. The Netherland study was a longitudinal cohort study, reporting the prevalence, associated delivery-related and psychosocial factors, and consequences of self-reported pelvic girdle pain during and after pregnancy while the present studies is a cross-sectional study.

Surprisingly, in this study, there is neither association between pelvic girdle pain and the gestational age nor correlation between the gestational age and maternal age with PGP, which is contrary to the findings elsewhere [13]. The possible reasons might be most of the study participants(72.2%) in this study were younger adults (21 to 30 years) and the variations in pain perception influenced by multiple factors like; family role, domestic work, cultural, ethnic background, and adaptation to pain could have influenced these differences.

The present study found that previous history of PGP and back pain has a significant association with the current pelvic girdle pain among pregnant women. The recurrence of PPGP with subsequent pregnancy, unknown risk factors, and lack of preventive measures are reported by several studies [15, 17, 35, 36]. The findings elsewhere also suggest that the relapse of PPGP is usually more prevalent, severe, and chronic, making PPGP a major public health problem and one of the significant maternal morbidity [37, 38]. Other studies, advocates the possible role of hormones like relaxin, progesterone on the pelvic girdle ligaments, and separation of pubic symphysis [39]. However, there is a lack of consensus in the association of these factors with PPGP. Moreover, potential factors like altered muscle mechanics, strenuous work, history of low back pain, ethnicity, and the number of previous pregnancies are reported to be strongly associated with PPGP[37]. Predictably, having one or more children (multiple pregnancies) was found to be one of the significant predictors of PGP among pregnant women in this study and this finding is worrisome considering the higher (4.2 births per woman) fertility rate of Ethiopia (https://knoema.com/atlas/Ethiopia/topics/Demographics/Fertility/Fertility-rat). This finding is
consistent with the study done in Australia[40] and another cross-sectional study found that parity was significantly associated with PGP among pregnant women [19, 21]. The possible explanation might be, multiple pregnancies associated with altered musculoskeletal structures, degeneration, and repetitive stress of pelvic structures could result in chronicity and relapse of PGP. The absence of preventive measures, unknown aetiologies, and lack of specific interventions could also possibly result in high prevalence in this subgroup [17, 29].

Given that PPGP and possible reoccurrence of PGP among Ethiopian mothers is reasonably common, and the association of PGP with multiple pregnancy keeping in mind the higher fertility rate of Ethiopian women implicates the importance of further reporting of the burden of this chronic and disabling maternal morbidity in this population. For the benefit of future researches, there are some noteworthy limitations. First, pelvic girdle pain was self-reported with a recall period of gestational time without physical examination to the self-reported measures to confirm the classification of PPGP and some of the variables like psychological factors, postural assessment, and some of unmeasured societal or lifestyle variables were not considered. These confounders could lead to a possible variation in the estimation of association among PPGP and other variables. The cross-sectional nature of this study presents limitations in terms of causal association interpretations and long term effects through to the postpartum period. Future studies should address these concerns and determine causality and effect among pregnant women. Nevertheless, no prior study has directly examined the prevalence of PGP in pregnant women in Ethiopia and we strongly feel that these findings will provide more insight into the burden of PPGP in Ethiopia.

**Conclusion**

About 1/4th of pregnant women self-reported pelvic girdle pain at any point during pregnancy. Parity, previous pelvic girdle pain, and back pain are factors predicting the risk of PPGP and the occurrence seems to peak in the third trimester of the pregnancy. Reflecting on the facts like higher fertility rate, lack of utility of ANC, relapse and chronicity PGP, and absence of specific interventions PGP among Ethiopian pregnant women should be counted as a major women health problem.

**Abbreviations**

**ACOG:** Ante Natal Care; **AOR:** Adjusted Odds Ratio; **BP:** Back Pain; **COR:** Cruds Odds Ratio; **EDHS:** Ethiopian Demographic Survey; **HSTP:** Health Sector Transformation Plan; **Km:** Kilometer; **LBP:** Low Back Pain; **LMICs:** Low-middle income countries; **MMR:** Maternal Mortality Ratio; **MoH:** Ministry of Health; **PGP:** Pelvic Girdle Pain; **PPGP:** Pregnancy-related Pelvic Girdle Pain; **SD:** Standard Deviation; **SSA:** Sub-Saharan Africa; **UNFPA:** United Nations Population Fund; **UoGCSH:** University of Gondar Specialized Hospital; **USA:** United State of America.

**Declarations**
Ethical approval and consent to participate

After informing the purpose, benefits, risk, the confidentiality of the information, and the voluntary nature of participants in the study, written consent were obtained from each of the participants, for illiterate participants, the consent form was read for them following after which thumb impression was obtained. Name and personal identifiers were not included in the questionnaire. The participant’s involvement in the study was voluntary and respondents were informed to refuse or stop at any point during the interview. Ethical clearance was obtained from the ethical review committee of the University of Gondar (Ref no; SOM/056/7/2019), College of Medicine and Health Sciences, from the School of Medicine.

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Authors’ contributions

MG wrote the proposal, supervises, and coordinated the data collection activity, analyzed the data, and writing the manuscript. BJ and SG revise the proposal, reran analyses, supervised, and participated in the data collection, analysis, manuscript writing, and review process. All authors read and approved the final manuscript.

Availability of data and materials

All data relevant to our findings are contained within the manuscript. Requests for further details on the dataset and queries concerning data sharing shall be arranged based on a reasonable request to the corresponding author.

Consent to publication

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Competing interests

The authors declare that they have no competing interests.

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