**BMJ Open Sport & Exercise Medicine**

Self-reported reproductive health of retired elite women's footballers: a cross-sectional study

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ABSTRACT

Objectives The primary objective of this study was to describe the self-reported reproductive health of retired elite women's footballers with specific reference to menstrual function, pregnancy and motherhood, contraceptive use and pelvic floor function.

Methods An electronic survey was disseminated to women's footballers (18 years or older) who had retired from elite football within 10 years of completing the survey.

Results 69 respondents completed the survey (mean age 35.8 years, mean age at retirement 30.3 years). One-third of participants self-reported experiencing at least one episode of amenorrhoea (>3 months without menstruation) for reasons other than hormonal contraceptive use or pregnancy. Three participants (mean age of 41 years, range 30–54) reported having reached menopause at the time of the study. 54 (78.3%) participants were not using any form of contraception. 17 (24.6%) of the participants are mothers (range 1–3 children). 51 of the participants (73.9%) had never been pregnant, and the majority of those who had been pregnant (86.7%) became pregnant in less than 2 years following the onset of desire for pregnancy. Four of the retired players gave birth during their playing career, and the mean time to return to competitive matches following delivery was 22 weeks. The mean Pelvic Floor Distress Inventory-20 score for participants was 72.

Conclusion These insights can be used to inform future efforts to promote positive reproductive health outcomes for current, former and future women's footballers. Research efforts should focus on improving the understanding of how to effectively support women's footballers in the perinatal period. Best practice guidelines on the use of menstrual cycle monitoring and pelvic health support would improve standards of care for women's footballers. Stakeholders should consider gender-specific postretirement care for women's footballers.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Elite women athletes often compete during their peak reproductive years and this has potential implications for their reproductive health.
⇒ There are high rates of amenorrhoea among elite women athletes, and this is likely to be associated with negative health outcomes.

WHAT THIS STUDY ADDS

⇒ This study provides insight into the self-reported reproductive health outcomes of retired elite women's footballers with specific reference to menstrual function, pregnancy and motherhood, contraceptive use and pelvic floor function.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The information presented here can be used to inform future efforts to promote positive reproductive health outcomes for current, former and future women's footballers.

perinatal and postpartum considerations, a lack of widespread maternity policies or a lack of contractual security.[1–5] While there is an increasing research interest in the relationship between the menstrual cycle and its relationship with health and performance in women's footballers, the understanding of more detailed reproductive outcomes in elite women's footballers is limited, both during and after a player's career.[6 7]

A recent scoping review[8] highlighted that there are very few studies examining long-term health outcomes among retired elite women's footballers, which reflects the broader research landscape in women's sport (including football).[9 10] A small number of studies have investigated musculoskeletal[11 12] and mental health[13–15] conditions among retired women's professional footballers, but there are no studies examining female-specific health considerations in this population. These female-specific

INTRODUCTION

Elite women's footballers often compete during their peak reproductive years, in some cases compelling them to choose between motherhood and their football career. This professional and personal dilemma can be due to a combination of sport-related

considerations include (but are not limited to) Relative Energy Deficiency in Sport (REDs), fertility and pregnancy, contraceptive use, pelvic floor dysfunction and menstrual cycle disorders.

Female athletes (with or without REDs) can experience menstrual dysfunction, with unknown impacts on long-term fertility or pregnancy outcomes.[1 16–19] A study among retired elite women rowers and rugby players (n=74) reported high rates of amenorrhoea, older age at childbirth and earlier onset of menopause suggesting a narrower 'reproductive window' for female athletes.[20] One study (n=34) identified positive pregnancy outcomes in a cohort of active elite athletes, with athletes getting pregnant easily, delivering healthy babies and returning to sport post partum.[3] There is some understanding of hormonal contraceptive use among active women's footballers, with one study showing that about a third of players at the highest level in England use hormonal contraception.[21] Further studies are needed to understand the reasons for hormonal contraceptive use in women's footballers, including the risks and benefits from a health and performance perspective. With respect to pelvic floor health, athletes appear to be at higher risk of pelvic floor dysfunction than the general population, and this can lead to psychological distress.[22] Athletes who have given birth are likely to be at greater risk of pelvic floor dysfunction.[23]

An improved understanding of female-specific health considerations among retired elite women's footballers would empower key stakeholders (eg, sporting organisations, governing bodies, athlete health and performance teams) to support athletes during and after their career.[24] This could be done by putting preventative measures in place where any potential concerns or risks have been identified. In particular, greater knowledge with respect to reproductive health outcomes (eg, menstrual function, fertility) among retired elite women's footballers may help to promote better provisions for players who would like to have children during or soon after their career. Therefore, the primary objective of this study was to describe the self-reported reproductive health of retired elite women's footballers with specific reference to menstrual function, pregnancy and motherhood, contraceptive use, and pelvic floor function. Secondary objectives of this study were to explore the likelihood of a history of a stress fracture among retired players whose menstrual period had stopped for 3 months or more (for reasons other than contraception or pregnancy), and to compare pelvic floor health outcome measures between retired players who had given birth against those who had not.

METHODS
Study design
An observational study based on a cross-sectional design through means of an electronic survey was conducted. In order to ensure a high quality of reporting, the Strengthening the Reporting of Observational Studies in Epidemiology statement and Checklist for Reporting Results of Internet E-Surveys were adhered to.[25–27]

Participants
Inclusion criteria were women, 18 years or older, retired from elite football within the 10 years prior to completing the survey and able to understand text written in English. Participants were excluded if they had retired more than 10 years ago, or if they had not played an elite level of football according to the study's inclusion criteria, which was defined as an individual who competed at the senior international level and/or in the highest or second highest national domestic league, which would be considered tier 4 or tier 5 according to standard participant classification criteria.[28] Remuneration for playing football was not considered a prerequisite for participation in the study due to the largely semiprofessional/amateur landscape of elite women's football until relatively recent advancements. A sample of retired elite women's footballers was recruited via convenience and snowball sampling. Participants were recruited through a variety of means including invitations from national governing bodies and players' unions (national and international), 'word of mouth' and social media recruitment.

Patient and public involvement
One retired professional women's player was invited to complete the study and to provide feedback on its content and design prior to wider dissemination. The retired player gave feedback on survey design, wording of questions and proposed including an additional question.

Outcome measures
Menstrual function
Seven questions were included to assess menstrual function. Age of menarche was assessed with a single question (eg, 'At about what age did you begin to menstruate?'). Participants were asked whether they have reached menopause ('Have you reached menopause?' YES/NO). Menopause was not defined for the purposes of the question. Mean menstrual cycle length and duration of menstruation were measured in a number of days. Participants were invited to describe the regularity of their cycle as either regular, irregular or very irregular according to their perception. Participants were asked about their experience of pain during their menstrual cycle, with options to specify whether the pain occurred before, during or after menstruation. Participants were asked to recall whether following menarche, they had ever experienced their periods stop for three or more consecutive months (for reasons other than hormonal contraceptive use or pregnancy) with YES/NO answer options.

Contraception use and hormonal replacement
Two questions assessed contraception and hormonal replacement (eg, hormone replacement therapy for menopause) use. Participants were asked about their current use of contraception use (including listed options

for barrier and hormonal methods), with 10 options available to choose from. Postmenopausal hormonal replacement use was assessed ('Are you currently using hormone replacement?') with YES/NO answer options.

Pregnancy and motherhood

A total of 11 questions were included that evaluated pregnancy and motherhood. Motherhood and pregnancy were initially assessed with the questions ('Are you a mother?'; 'Have you been pregnant?') with YES/NO answer options. Follow-up questions included 'How many children do you have?', 'How did you give birth?' (Vaginal delivery; Caesarean delivery). Participants were asked to report the duration of time it took them to become pregnant following the onset of desire for pregnancy; 'How long on average did it take you to become pregnant following the onset of desire for pregnancy?' (Less than 1 year; 1–2 years; more than 2 years). The number of previous pregnancies and pregnancy losses were recorded. For participants who responded that they had previously given birth, they were asked whether they had given birth during their playing career. If they answered 'YES', they were asked 'How long did it take to return to training?' (number of weeks) and 'How long did it take to return to competitive matches?' (number of weeks).

Pelvic floor dysfunction

The Pelvic Floor Distress Inventory (PFDI-20) was used to assess pelvic floor function among this cohort of retired elite women's footballers. The PFDI-20 is a 20-item questionnaire divided into three subscales: six items evaluating Pelvic Organ Prolapse Distress (POPDI-6), 8 items assessing Colorectal anal Distress (CRADI-8) and six items evaluating Urinary Distress (UDI-6).[29] Each question relates to the presence of an individual symptom. An example question includes 'do you usually experience frequent urination?'. If the symptom is present, the responder scores it on a 4-point scale to indicate the extent of distress; score 1 is not at all, and 4 is quite a bit. POPDI-6, CRADI-8 and UDI-6 are each scored similarly. First, subscale scores for each scale are obtained by taking the mean value of all items answered within each subscale. These subscale scores are determined by multiplying each scale's mean score by 25, which gives each subscale score a range of 0–100. Therefore, the total scale score is calculated by summing the subscale scores (a range of 0–300). A higher score is suggestive of more symptoms and higher levels of distress due to the symptoms.

Procedures

An online questionnaire was developed in English using an electronic data management system (Castor EDC, www.castoredc.com). Eligible patients received an invitation by email between November 2021 and July 2023, followed by periodic reminders at random intervals. This questionnaire included the following descriptive variables: age, height, body weight, duration of elite football career, level of play, nature and duration of retirement, level of education, and current employment status. Information about the study was sent to potential participants. All participants gave their electronic informed consent and filled in the questionnaire. Players participated voluntarily in the study and did not receive any financial remuneration for their participation. Participants were provided with a free copy of the book 'The Secret Balance of Champions' as a show of gratitude for completing the survey.[30] The questionnaire has been included in online supplemental material.

Statistical analysis

All data were self-reported. The statistical software IBM SPSS V.28.0 for Apple Mac was used for data analysis. Descriptive analyses (mean, SD, frequency and range) were performed for all variables, using percentages for categorical variables and means and SD for continuous variables. Pearson correlation coefficient (r) was used to assess the association of amenorrhoea and a history of stress fracture (r value less than 0.3 was considered small; 0.3–0.5 moderate; 0.5–0.7 large; 0.7–0.9 very large and >0.9 near perfect for predicting relationships).[31] The Mann-Whitney test (independent samples) was used to determine normal distribution and make comparisons between groups, respectively.[32] Associations with $p \leq 0.05$ were considered to be statistically significant.

RESULTS

Demographics

69 respondents completed the survey in full and were included in the final analysis. The mean age of participants was 35.8 years (SD=5.7, range 24–54) while their mean age at retirement was 30.3 years. The mean number of seasons as an elite footballer was 10.6 seasons (SD=5.2, range 2–21 years). The mean duration of retirement at the time of survey was 5.5 years (SD=5.4). 64 (92.8%) participants reported playing in the highest national league, and 79% (n=53) played senior international football. Eighteen different countries (across six continents) were represented in the survey, with England representing the highest number of participants (n=15, 21.7%). Over one-third (n=26, 37.7%) retired from elite football due to injury. Participant characteristics are presented in table 1.

Menstrual function

The mean age of menarche among respondents was 14 years (SD=2). The mean duration of menstrual cycle was 23.7 days, with 4 days of menstrual bleeding. 11 participants (15.9%) subjectively described their menstrual cycle as irregular, with 6 (8.7%) describing their menstrual cycle as very irregular. One-third (n=23) of participants experienced at least one occasion of their period stopping for 3 months or more for reasons other than hormonal contraception or pregnancy. 16 of the participants (23.2%) had been diagnosed with a stress

Table 1 Demographic information of survey respondents (n=69)

Current age (years)	35.8 mean, 5.7 SD, range 23–54
Height (cm)	167 mean, range 146–182
Weight (kg)	65.2, range 50–96
Age at retirement (years)	30.3 mean
Currently in employment:	
Yes	n=59, 85.5%
Number of years since retirement	5.5 (SD=5.4)
Number of years as a professional footballer	10.6 mean, range 2–22
Reason for retirement (more than one option available for selection):	
Injury	n=26, 37.7%
Personal choice	n=41, 59.4%
Financial reasons	n=11, 15.9%
Other	n=7, 10.1%
Highest level of education:	
No school completed	n=0, 0%
Nursery/elementary school	n=0, 0%
High school	n=9, 13%
Vocational/technical school	n=1, 1.4%
College, university or equivalent	n=59, 85.5%
Position (more than one option available for selection):	
Goalkeeper	n=8, 11.6%
Defender	n=34, 49.3%
Midfielder	n=23, 33.3%
Forward	n=11, 15.9%
Level of play:	
Highest national league	n=64, 92.8%
Second highest national league	n=3, 4.4%
Other	n=1, 1.4%
Played international football	n=53, 76.8%

Table 2 Menstrual function of participants (n=69)

Age of menarche (years)	14 (SD=2), range 10–20
Mean duration of menstrual cycle (days)	23.7
Mean number of days of bleeding during menstrual cycle	4 days
Reached menopause:	
Yes	n=3, 4.4%
Perception of menstrual cycle regularity):	
Regular	n=46, 66.7%
Irregular	n=11, 15.9%
Very irregular	n=6, 8.7%
Did not say	n=6, 8.7%
Experience pain during menstrual cycle:	
No	n=17, 24.6%
Yes, before a bleeding period	n=16, 23.2%
Yes, during a bleeding period	n=29, 42%
Yes, after a bleeding period	n=0
Did not say	n=7, 10.1%
Period stopped for 3 months or more (for reasons other than pregnancy or contraception):	
Yes	n=23, 33.3%

replacement therapy. The findings are summarised in table 3.

Pregnancy and motherhood

17 (26%) of the participants are mothers (range=1–3 children) (note motherhood does not imply previous pregnancy). 51 of the participants (77%) had never been pregnant. For those who had been pregnant (n=15), nine became pregnant in less than 1 year following the onset of desire for pregnancy, four became pregnant within 1–2 years and two became pregnant over 2 years after the onset of desire for pregnancy. Eight out of 15 participants who had been pregnant became pregnant

fracture at some point during their football career. There was a weak correlation (*r*=0.1) between a history of amenorrhoea for 3 months or more and having sustained a stress fracture. Three participants (mean age of 41 years, range 30–54) reported having reached menopause at the time of the study. The findings are summarised in table 2.

Contraception use and hormonal replacement

54 (78%) participants were not using any form of contraception at the time of the study. Three (4%) were using a form of contraceptive pill and 5 (7%) were using a contraceptive implant. No participants were using hormonal

Table 3 Contraceptive and hormonal replacement use among participants (n=69)

Contraception:	
None	n=54, 78.2%
Contraceptive pill	n=3, 4.4%
Condom n=2, 2.9%	
Contraceptive implant	n=5, 7.3%
Other	n=4, 5.8%
Did not say	n=2, 2.9%
Hormone replacement therapy	n=0

Table 4 History of pregnancy and motherhood amongst participants (n=69)

Number of participants who are mothers	17, 24.6%, range 1–3 children
Have you ever been pregnant:	
Yes	n=15, 21.7%
No	n=51, 73.9%
Did not say	n=3, 4.4%
Pregnancy onset desire (n=15 participants):	
Became pregnant in less than 1 year	n=9, 60%
Became pregnant in 1–2 years	n=4, 26.7%
Became pregnant in 2+ years	n = 2, 13.3%
Number of pregnancies (n=15 participants):	
Total number of pregnancies among participants	27, range 1–5 per participant
Mode of conception (n=15 participants):	
Sexual intercourse	n=8, 53.3%
Sperm donation	n=5, 33.3%
Insemination with partner's sperm	n=1, 6.7%
Would rather not say	n=1, 6.7%
Mode of delivery (n=17 term deliveries)	
Vaginal delivery	n=13
Caesarean delivery	n=4
Pregnancy loss	n=8, 14 total (range 1–5 pregnancy losses)
Number of participants who gave birth during their playing career	4
Number of weeks to return to training	range 6–52, mean 19 weeks
Number of weeks return to competitive matches	range 6–52, mean 22 weeks

through sexual intercourse, 5 through sperm donation, 1 through insemination with partner's sperm and 1 participant selected the option 'would rather not say'. Eight participants reported having at least one pregnancy loss, with one participant having experienced five pregnancy losses. Four of the retired women's players gave birth during their playing career, and the mean time to return to competitive matches following delivery was 22 weeks. The findings are summarised in table 4.

Pelvic floor dysfunction

The mean PFDI-20 score for participants was 72 (lower scores indicate better pelvic floor function) (SD 35.2; range 8–151). There was no significant difference in PFDI-20 scores between participants who had delivered a baby through vaginal delivery (n=13) compared with those who had not (n=53) (Mann-Whitney test: U=327.00, Z=−0.28).

DISCUSSION

This study describes the self-reported reproductive health of an elite cohort of women's footballers (79% of participants previously played senior international football) with specific reference to menstrual function, pregnancy and motherhood, contraceptive use and pelvic floor function. 33% of retired elite women's footballers had experienced amenorrhoea at some point during their lifetime, with

less than a quarter of the cohort being mothers. Of those who had become pregnant, 60% became pregnant within 1 year of trying. There did not appear to be any self-reported evidence of significant pelvic floor dysfunction in this population.

Pregnancy and fertility considerations among retired women's footballers

With increasing numbers of women playing elite football[33] and potentially more competing after pregnancy, a better understanding of how to support these players is necessary. There is a growing interest in understanding pregnancy outcomes among active and retired elite female athletes,[1] with emerging research suggesting that appropriately modified elite sport participation during pregnancy is not associated with adverse events during pregnancy, labour or delivery.[3 18] With reference to elite football, outcomes of interest may include (but not be limited to): recognising barriers to pregnancy for elite footballers, understanding their experiences of pregnancy, assessing the extent to which the provision of care that is sensitive to their sporting ambitions, best practice guidelines for how they should continue to train/return to training post partum and information on time to return to full training and match play. The mean return to match play for players post partum in our study was 22 weeks. Although we did not assess risk of injury

following return, there is evidence to suggest risk may be elevated during this period (eg, due to rapid changes in training loads).[3] Evidence-based guidelines are required to safely support the return to sport of elite footballers in the postpartum period.[34]

Elite female athletes have described how there is a common societal and sporting narrative (including pressure from coaches) that suggests they must choose between being an athlete or becoming pregnant.[35] Peak performance and fertility windows may overlap, complicating decisions for athletes. A study of retired elite rowers and rugby players reported higher rates of amenorrhoea, older age at childbirth and a trend towards earlier symptoms or onset of menopause indicating a potentially narrower 'reproductive window' for female athletes.[20] In our study, 33% of participants reported amenorrhoea and three participants had reached menopause (range 30–54 years), although the reasons (eg, premature ovarian failure) for early menopause in two participants aged 30 and 39 are unclear. This experience of amenorrhoea is lower than previous data recorded among retired elite athletes (45%)[20] but higher than the general population.[36] Less than a quarter of retired elite players in our study had been pregnant, which is relatively low considering the demographic of the population. Another study in a retired, mostly subelite, population reported that nearly half the participants had become pregnant.[15] Understanding the reasons for low pregnancy rates among retired elite women's footballers compared with the subelite population, is worth considering further.

Pelvic floor health

There has been a positive promotion of pelvic floor health among professional women's footballers.[37] These initiatives have the potential to improve outcomes for women's footballers and to increase awareness of important health issues. Contact sports, such as rugby, have shown high rates (43%) of stress urinary incontinence (SUI) in active elite players (n=396) and players who had given birth were most at risk (106/172 of active elite players with SUI had given birth).[38] The mean PFDI-20 score for participants was 72 (SD=35.27) in our study which is lower than reference groups used in validation studies indicating better pelvic floor function, although this should be interpreted with caution due to the limited validity of interpreting the PFDI-20 in the general population.[39 40] Although pelvic function was satisfactory among the retired elite women football players in this study, steps should be taken to identify and support those who may be most at risk (eg, during the perinatal period).[41] Using screening tools validated in athlete populations (eg, PFD-SENTINEL) may provide the most clinically relevant information, although this had not been developed at the time of the survey design.[42]

Clinical implications

This study addresses the limited evidence with respect to the reproductive health of retired elite women's footballers.[8] The data collected here and in the study by Ling *et al*[15] provide useful information on women players which can be used to provide gender-specific support postretirement, such as has occurred with retired men's players.[43] This may include, but not be limited to, providing support with respect to fertility, pregnancy and pelvic floor health. These initiatives should complement efforts and policies to support women's footballers becoming pregnant during their career, should they wish to do so.

The number of former players who had experienced menstrual irregularity (n=17, 24.6%) and/or amenorrhoea (n=23, 33.3%) mirrors findings from Ling *et al*, where a number (n=115/560, 21.7%) of retired football players reported their menstrual periods had stopped for ≥3 consecutive months.[15] These findings lend support to the importance of menstrual cycle monitoring in professional football to support women's health and performance (eg, to screen for early signs of REDs).[44]

Future research directions

This study highlights the need to understand reproductive health outcomes among retired women's footballers in greater detail—to empower practitioners and governing bodies to better support women's footballers during and after their career. Research efforts should focus on evaluating how to effectively support women's footballers in pregnancy, through to postpartum return to play. Additionally, understanding the best practice approach with respect to menstrual cycle monitoring in professional football, and how to advise those with irregular cycles is likely to benefit players across women's football. These approaches may lead to, among other benefits, an improved understanding of the impact of REDs on professional footballers both during and after their careers (eg, injury, fertility). For future survey design, it may be worth including 'I don't know' as an option, and while menopause was not defined for the purposes of the study (as a level of understanding among participants was anticipated), future studies could consider adding a question that increases the accuracy of participants' responses; for example, 'Have you been 'diagnosed' with menopause by a medical doctor?'. In addition to assessing for the presence of menstrual pain and regularity, future studies should consider assessing for the presence of other menstrual cycle symptoms as this may prove important to understanding the reproductive health of retired women players.

Strengths and limitations

This study describes self-reported reproductive health outcomes in an elite women football population and paves the way for future research in this area. The findings may not necessarily apply to current professional women's footballers considering the changing nature of the sport and the recent improvement in conditions. The major limitation of our study is the number of respondents that was relatively low, with only 69 respondents

completing the survey in a 20-month period. The self-reported nature of the survey and potential for selection and recall bias are also important considerations which may further limit the generalisability of our findings. The use of PFDI-20 in this study is limited by not establishing the presence of pelvic floor dysfunction prior to dissemination.

CONCLUSION

This study describes the self-reported reproductive health of an elite cohort of women's footballers with specific reference to menstrual function, pregnancy and motherhood, contraceptive use and pelvic floor function. A number (n=23, 33.3%) of retired elite women's footballers reported experiencing amenorrhoea, with less than a quarter of the cohort being mothers. For those who had become pregnant, the majority became pregnant within 2 years of trying. There did not appear to be any evidence of significant pelvic floor dysfunction in this population. Future research efforts should focus on improving the understanding of how to effectively support women's footballers in pregnancy, through to postpartum return to play. Best practice guidelines on the use of menstrual cycle monitoring and pelvic health support would also likely improve standards of care for women's footballers. Finally, stakeholders should consider gender-specific postretirement care for women's footballers, as has been developed for men's footballers.

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Patient consent for publication Not applicable.

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