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Reproductive health and elite sport: assessment of the quality of life of female athletes in Yaoundé.

Mendibi Sandrine R.[1,2], Metogo N.Junie[2] ,Ayissi ngono Xavier[2], Ayissi Gaspard G. , Nsi Celestine C [1], Jim Nemy H [1], Bissou Mahop [3], Noa N. Claude[2] Essi Marie-José [1].

1 Departement of Public Health, Faculty of Medicine and Biomedical Science, The University of Yaounde I, Yaoundé, Cameroon

2. Department of Gynecology and Obstetrics Faculty of Medicine and Biomedical Science, The University of Yaounde I, Yaoundé, Cameroon.

3 General surgeon, specialist in sport medicine, Faculty of Medicine and Biomedical Sciences

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ABSTRACT

Background: While the physiological, psychosocial and obstetric health benefits of exercise are well established, there is less awareness of the health implications of long-term intense exercise.

Objective: The aim of this study was to assess the life quality of elite sport women and the impact of high performance sport on their reproductive health in Cameroon.

Patients and Method: We carried out a cross-sectional study over a period of one year (from October 2018 to September 2019) among active sportswomen in clubs and sports associations of the Yaoundé city. One hundred and five (105) high performance athletes were included in this study. Anthropometric parameters, menstrual patterns, social and psychological data were recorded through pre-tested survey forms. Statistical analysis was done with SPSS 20. The significance threshold value was set at 0.05

Results: The mean age of participants was 32.6 ± 8.5 years. Sixty per cent of the athletes were still active and 48% had more than 10 hours of physical activity per week. Oligomenorrhea (6%) and amenorrhea (12%) were the commonest menstrual cycle disorders. The most frequent physical changes were muscle gain (60%); urinary incontinence (UI) (67%) and prolapse (18%) were the most frequent gynecological conditions. 57% of the participants were nulliparous but 34% had never conceived. 20% of the participants had sports abortions. The most commonly used modern contraceptive method was the male condom (76%). 53% of the participants practiced sports as a hobby, while 32% sought fame. Top-level sport was responsible for the increase in self-esteem of 61% of the participants.

Conclusion: Apart from LEA-related reproductive disorders, which can be easily managed with increased energy intake, elite sport has an overall positive impact on the quality of life of female athletes, physically, mentally and sexually even the programmation of the pregnacy.

Keys words: Reproductive health, elite sport, female athletes, life quality.

I. INTRODUCTION

Reproductive health refers to the physical, mental and social well-being of a person in relation to the proper functioning of the reproductive system [1] . Since several decades women have become increasingly physically active, and it has long been known that sport plays a crucial role in the promotion of women's health [2]. For example exercise plays a key role in weight loss blood pressure control and the maintenance of bone mineral density (BMD). Exercise also has the potential to influence mental health by enhancing physical perception and self-esteem, and it can help alleviate anxiety [2].

While exercise provides substantial health benefits, intensive exercise is also associated with a unique set of risks for the female athlete, many of which are gynecological [3] . Indeed, in elite sportswomen, expenditure sometimes outweighs intake, the resultant state of negative energy balance is referred to as low energy availability (LEA). Energy availability is determined by subtracting energy expenditure from energy intake relative to fat-free mass, and chronic LEA can impact on a number of key physiological systems, including metabolism, bone health, immunity, cardiovascular health and psychological wellbeing, as well as menstrual and reproductive function.

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This syndrome of inter-related health consequences has been termed Relative Energy Deficiency in Sport (RED-S) by the International Olympic Committee [4] .

The impact of RED-S on reproductive function leads to down-regulation of the hypothalamic–pituitary–ovarian axis, manifesting clinically as oligomenorrhoea or amenorrhea, delayed menarche, subfertility, disordered eating and bone health related complications due to the subsequent hypoestrogenic state [2] . The elite sportswomen of the city of Yaoundé may be concerned not only by the impact of RED-S on their reproductive function, but also by the psychosocial considerations of our society towards them. Thus, we sought to assess their life quality and the impact of high-performance sport on their reproductive health in this study.

Patients and Method

Study setting: We conducted a cross-sectional study over a period of one year (from October 2018 to September 2019), data were collected among sportswomen in clubs and sports associations in Yaoundé.

Sample size and data collection: We used an exhaustive sampling method. Data: anthropometric parameters (weight, height and body mass index); menstrual patterns (menarches, Oligomenorrhea, amenorrhea, dysmenorrhea); clinical data (prolapse, urinary incontinence…); social status (marital status, parity, conception and infertility features…); and psychological data (sexual and mental behaviors…) were conceptualized using a matrix of dimensions and collected using a pre-tested self-administered survey form through interview.

Interviews with elite sportswomen were conducted by investigators who had received prior training on understanding and completing the survey form. The data collection took place in clubs and sports associations after obtaining the consent of the participants. A self-administered survey form was provided to each athlete who agreed to participate in the study.

Outcome: The main outcome in this study was to assess the impact of elite sport on the clinical, psychological and sexual life quality of elite sportswomen.

Ethical consideration:An ethical clearance for the study was obtained from the ethical committee of the Faculty of Medicine and Biomedical Sciences, University of Yaounde I. Informed consent was obtained from all participants.

Patients: One hundred elite sportswomen were included in this study. Inclusion criteria were as follows: practice at least one regular physical activity of more than 10 hours per week in the city of Yaoundé and having given informed consent to participate in the study. Fifty incomplete survey forms were excluded.

Statistical analysis: Statistical analysis was done with the Statistical Package for the Social Sciences (SPSS), version 26 software (IBM Corporation, 2020). The significance threshold value was set at 0.05.

II. RESULTS

- **Socio-demographic data**

The most represented age groups were] 25-30 years] and >35 years. Seventy-seven percent of the elite sportswomen were single and 60% were employee. Forty-five percent of them had a family lifestyle.

- **Elite sportswomen profile**

Table I: frequency of Elite sportswomen profile

Variables	N= 105	Frequency (%)
Status	Active	65
	Retired	35
Type of sport	Track and field	10
	Basketball	25
	Football	14
	Volleyball	12
	Judo	4
	Jumping	5
	Box	6

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Evolution level	League	32
	National	27
	International	41
Hours of practice/week	6-10	52
	11-15	20
	16-20	16
	>20	12
Duration of the career (years)	-5	8
	6-10	38
	11-15	39
	16-20	9
	+20	5

Our study population were majoritary active in sixty five per cent. Basketball (25%), football (19%), volleyball (12%) and track and field (10%) were the most represented sports. Forty-one per cent of the elite sportswomen evolved in international league, 52% practiced between 6 to 10 hours per week. The profile of elite sportwomen is described in the table above. Sexual intercourse was the main factor impairing the performance of elite sportswomen (41%).

- **Clinical features of elite sportswomen**

Only 2% of elite sportswomen had delayed menarches, 57% were nulliparous, the main physico-physiologic was muscle gain (60%). Oligomenorrhea was the main cycle disorder (60%). Urinary incontinence was present in 67% of elite sportswomen and prolapse in 18%. Miscarriage was main common in the first trimester of pregnancy and vaginal delivery was the mode (31%). Table II below, represents the clinical features of all the participants

Table II: Frequency of clinical features

Variables	N = 105	Frequency (%)
Menarches	≤10	7
	11-17	91
	≥18	7
Contraception	Condoms	76
	Pills	25
	Abstinence	2
	None	2
	0	57
Parity	1	26
	2	10
	3 and above	7
	Muscle gain	60
Physico-physiological changes	Weight loss	17
	Cycle disorders	20
	None	7
	Menorrhagia	2
Type of cycle disorders (n=20)	Amenorrhea	6
	Oligomenorrhea	12
	Urinary incontinence	67
	Prolapse	18
Genito-urinary		

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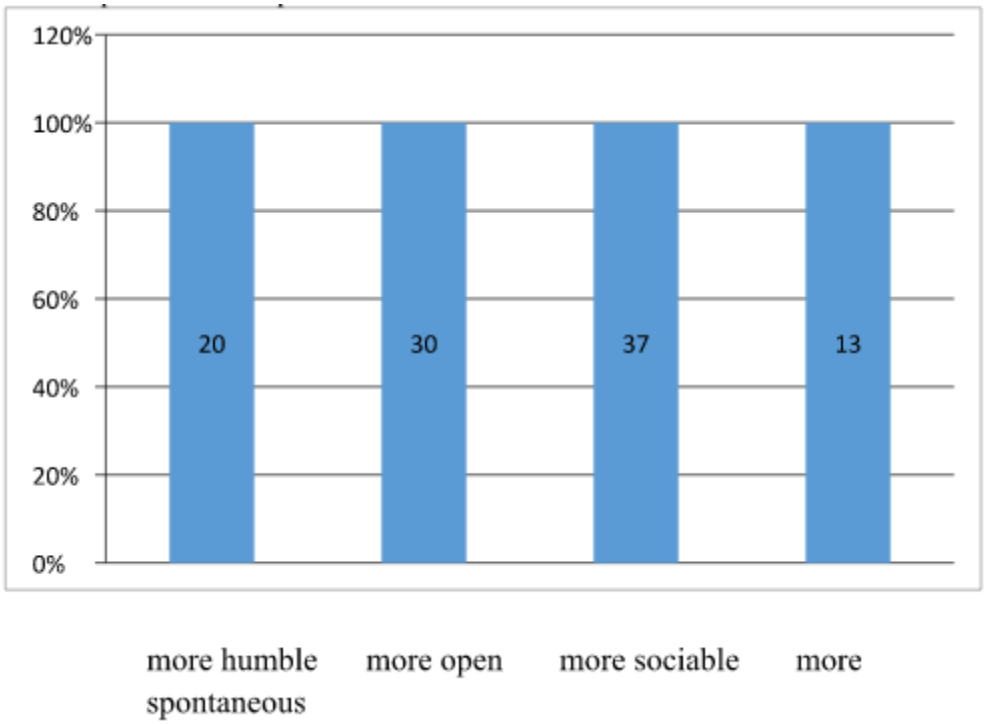
disorders	≤ 12 weeks	10
	13-20 weeks	7
	>20 weeks	3
Sport and miscarriage		
	Vaginal delivery	37
	Caesarian section	6
Delivery mode (n=43)		

91% had their period at a normal age, the preservative was the most used method at 76%, the majority were nullipart at 57%, more than half described a weight gain at 60%, urinary incontinence was the genito-urinary disorder most found at 67%.

- **Psychosocial and Sexual life of elite sportswomen**

Sport made elite sportswomen more sociable (67%), and proud (61%). Elite sport gaved many vertus on the life quality of elite spotwomen .The graph (graph 1) below showed the impact of the sport on elite sportwomen.



Graph 1: Impact of elite sport on sportwomen

The main motivation of the practice of elite sport was hobby (60%). Condoms were the main contraceptive method used (76%) and pills (20%), Elite sportswomen were mainly heterosexual (70%), but a few was not according to the stigmatization and the law, as we see on the graph 2 bolow

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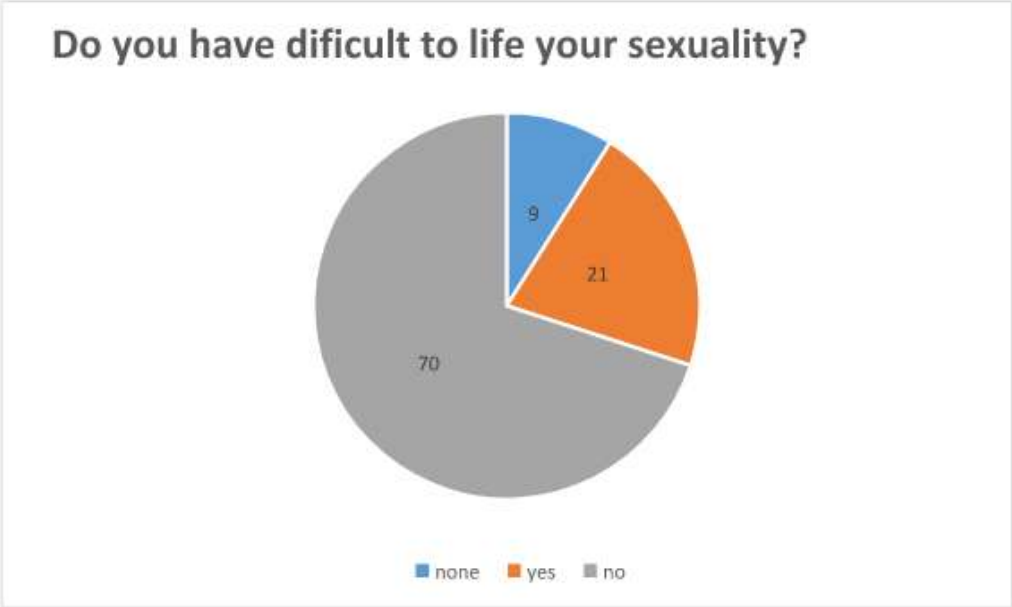
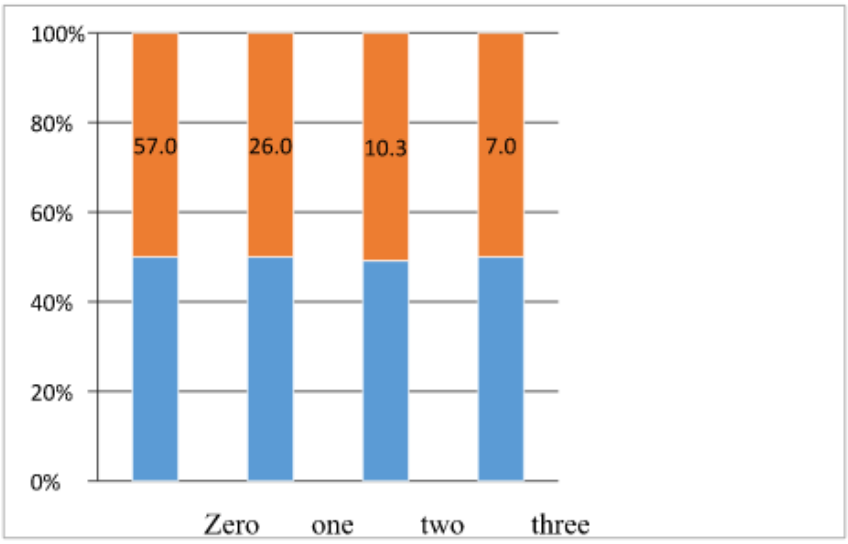


Graph 2 : Distribution of sexual fulfilment of elite sportwomen

70% of women do not have difficulty living their sexuality to the fullest, which may suggest that fertility is not compromised

- **Fertility profile of elite sportwomen**

Slightly more than half of the respondents (57%) were nulliparous. The number of children per ESW was minimum one and maximum three. However, all the nulliparous were not necessarily nulligest. Indeed, Number of pregnancy among our respondents ranged from zero to five. Some pregnancies having been sacrificed for various reasons but the recurring ones were: the bad moment, the peak of a career, sport first. To subscribe this dilemma of the moment, 46% of respondents thought that the maternity project was incompatible with high-level sport. Pregnancy appeared to be an obstacle to her quest for sporting excellence. A choice had to be made: the elite level or a family. The graph (Graph 3) below shows the distribution of maternity amont ESW.



Graph 3 : Distribution of maternity among ESW

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III. DISCUSSION

In our study, elite female athletes were over 18 years of age, with a median in the 25-30 age groups. Indeed, high performance sport is very poorly structured in our country, which would favour the late emergence of elite athletes. The social life of elite sportswomen reveals that they were mostly single, employee and have a family lifestyle in this study. This underlines the demands of elite sport for women, which are nowadays the same as those of men and which sometimes require sacrifices [5,6], mostly incompatible with a life as a couple. On the other hand, elite sport is not sufficiently remunerated in Cameroon, which explains why elite sportswomen are employees and why the majority of them live with their families.

Studies have shown that every female athlete in any sport regardless of level of competition has the potential to develop the athlete triad (functional hypothalamic amenorrhea, eating disorders and decreased bone mineral density) which is a part of the RED-S syndrome [7] . However those females participating in endurance sports, such as track and field, swimming, and rowing, or in those sports requiring subjective judging, such as gymnastics and figure skating, are most at risk [8] (Low Energy Availability in Female Athletes, 2021). In our series, the elite sportswomen were predominantly involved in track and field, basketball, football and volleyball, which are sports with a moderate to high risk of RED-S.

Similarly, RED-S appears to be more common in female athletes who train more than 20 hours per week. In our study, 28% of the athletes had more than 15 hours of training per week, which exposes them to the consequences of LEA. Kun Meng et al. had similar data when comparing the risk of LEA in Chinese female elite and recreational aesthetic sports athletes, and found a significantly higher prevalence of LEA risk (55.8% vs. 35.1%; $p = 0.012$) and amenorrhea risk (53.8% vs. 13.3%; $p < 0.001$) in elite Chinese athletes, with elite athletes having almost three times more training hours than their counterparts (28 versus 8 hours per week) [9] .

The main physico-physiological changes observed in the study population were muscle gain, weight loss and menstrual cycle disorders. Indeed, endurance sports such as athletics and sports involving subjective judgment and a strict diet, such as gymnastics, will not only be responsible for weight loss but will also be the most exposing to the risk of RED-S. On the other hand, some sports, such as basketball and volleyball, require a particular musculature and therefore a necessary muscular gain. In any case, the risk of REDS is no less important when it is known that it occurs when energy availability falls below a critical value of 20-25 kcal/kg lean mass/day [10]

Twenty per cent of the female athletes in our study reported symptomatic menstrual irregularity, with amenorrhea (6%) and Oligomenorrhea (12%) being the most common. While amenorrhea is approximately prevalent in 5% of the general population, smaller studies of athletes using the three-month definition of amenorrhea have shown a prevalence of up to 44% in dancers and 65% in long-distance runners [11] .The low rate of amenorrhea observed in our study may be related to the fact that only 10% of athletes practiced endurance sports. Amenorrhea can be caused by various etiologies; however, hypothalamic amenorrhea refers to amenorrhea caused by a deficiency in GnRH secretion, which results in a reduction in LH secretion episodes, with a consequent decrease in ovarian stimulation. In athletes, hypothalamic amenorrhea is the result of chronic LEA [2].

Oppositely, Hyperandrogenism (increased testosterone secretion) seemed to be the major cause of Oligomenorrhea in elite sportswomen. Indeed, evaluating the diurnal pattern of testosterone and pituitary hormones in endurance female athletes with different types of menstrual disorder, Rickenlund et al. found that the 24-hour hormone profiles in amenorrheic athletes showed decreased LH pulsatility and a peak amplitude of prolactin, as well as increased baseline levels of growth hormone and cortisol. In oligomenorrheic athletes, higher diurnal testosterone secretion was observed and levels of LH, prolactin, growth hormone, and cortisol were similar to those of regularly menstruating subjects [12]. Because the length of their cycles is so irregular, oligomenorrheic women may have difficulty conceiving as illustrating the rate of nullipara in this study. Oddly enough, however, they may also be at increased risk of an unintended pregnancy secondary to the difficulty of predicting the precise date of ovulation.

Although not included in the RED-S, Urinary incontinence (67%) and prolapse (18%) were the main clinical features of our elite sportswomen. Indeed, most of the athletes in our series practiced sports that increase intra-abdominal pressure leading to UI and prolapse. Araujo et al. had similar data with a prevalence of 76% of UI in

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female athletes [13]. In addition to sexual intercourse and menstruation, urinary incontinence not only had a negative impact on the performance of the athletes in our study as reported by carvalhais et al. but had also been shown to be detrimental to quality of life [14,15]. For example, in a study conducted by Caylet in 2006, female athletes reported that they feel embarrassed about UI and that it may affect their performance, but 84% had never spoken with their coaches or healthcare providers about it [16] .

LEA in female athletes results in a disruption of LH pulsatility and impairment of reproductive functions [8]. In addition, the age range at which elite female athletes are at their peak corresponds most often to the elective ages for conceive, posing a significant dilemma between career choice and motherhood, thus explaining the abortion rate in elite female athletes. In our series, 57% of the participants were nullipara, not because of infertility problems, but because they perceived carrying babies as an obstacle to a sports career. Sundgot-Borgen et al. had different data in a case-control study which aimed to enhance knowledge on pregnancy and return to sport in the postpartum period in elite female athletes. They found that elite athletes and active controls get pregnant easily, deliver healthy babies and returned to sport or exercise at week 0–6 postpartum [17] . Thirty-seven per cent of elite sportswomen have had a previous childbirth in this study (31% of vaginal deliveries versus 6% of caesarean sections), and none of them reported delivery as a factor modifying performance. In the same vein elite sport is not related to adverse delivery outcome, including length of labour, the need for caesarean section during delivery and severe perineal tears as shown by Sigurdardottir et al. in a case control study [18]. Hence, a sports career and pregnancy are not therefore incompatible, as the IOC has published a consensus statement on physical exercise for women planning pregnancy and those who are pregnant, providing a framework for the management of physiological and pathological situations related to pregnancy in elite female athletes [19] .

In this study, female athletes mostly practiced sport as a hobby, tended to be more sociable and felt pride in being elite athletes. The majority were more sexually aware and more likely to use modern contraceptive methods. Indeed anxiety and depression are less common in elite sportswomen than in general population because higher levels of physical activity and exercise are generally associated with lower risk of depressive symptoms [20,21] . Therefore, the impact of elite sport on the mindset of elite sportswomen will also affect their social and sexual lives, explaining why they are more open, more sociable and why they engage in healthy sexual behaviors.

Limitations : The study was limited to the athletes who filled well as the data analysed did not include a complete representation of all the participants. The data set used in the study included limited variables. The inclusion of more FA in the data set is important to analyse the differentials and particularities of each FA in many sports. Data sets are needed to update the policy implications of the sport medicine in Cameroon according to elite female health.

IV. CONCLUSION:

Apart from LEA-related reproductive disorders, which can be easily managed with increased energy intake, elite sport has an overall positive impact on the quality of life of female athletes, physically, mentally and sexually.

REFERENCES

[1]. WHO World Health Organization [Internet]. Available from: https://www.who.int/reproductivehealth/en/

[2]. Jones, B. P., L'Heveder, A., Saso, S., Yazbek, J., Smith, J. R., & Dooley, M. (2019). Sports gynaecology. The Obstetrician & Gynaecologist, 21(2), 85-94. https://doi.org/10.1111/tog.12557

[3]. Bachmann, G. A., Hsu, E., Ayers, C. A., Lu, C.-W., & Gastrich, M. (2016). High Intensity Female Sports Participation : Need for Sport-Specific Gynecologic Assessment [21F]. Obstetrics & Gynecology, 127(Supplement 1), 56S. https://doi.org/10.1097/01.AOG.0000483876.80850.c2

[4]. Mountjoy, M., Sundgot-Borgen, J., Burke, L., Carter, S., Constantini, N., Lebrun, C., Meyer, N., Sherman, R., Steffen, K., Budgett, R., & Ljungqvist, A. (2014). The IOC consensus statement : Beyond the Female Athlete Triad--Relative Energy Deficiency in Sport (RED-S). British Journal of Sports Medicine, 48(7), 491-497. https://doi.org/10.1136/bjsports-2014-093502

[5]. Kennedy, C. L. (2010). A New Frontier For Women's Sports (Beyond Title IX). Gender Issues, 27(1-2), 78-90. https://doi.org/10.1007/s12147-010-9091-y

[6]. Koller, D. (2010). Not Just One of the Boys : A Post-Feminist Critique of Title IX's Vision for Gender Equity in Sports (SSRN Scholarly Paper N° 2064794). https://doi.org/10.2139/ssrn.206479

[7]. Nazem, T. G., & Ackerman, K. E. (2012). The female athlete triad. Sports Health, 4(4), 302-311. https://doi.org/10.1177/1941738112439685

[8]. Heikura IA, Stellingwerff T, Areta JL. Faible disponibilité énergétique chez les athlètes féminines : du laboratoire au terrain. Revue européenne des sciences du sport. 2022 mai 4;22(5):709-19.

[9]. Meng K, Qiu J, Benardot D, Carr A, Yi L, Wang J, et al. The risk of low energy availability in Chinese elite and recreational female aesthetic sports athletes. J Int Soc Sports Nutr. 2020;17(1):13.

[10]. Loucks, A. B., & Heath, E. M. (1994). Induction of low-T3 syndrome in exercising women occurs at a threshold of energy availability. The American Journal of Physiology, 266(3 Pt 2), R817-823. https://doi.org/10.1152/ajpregu.1994.266.3.R817

[11]. Kishner S, Raj M. Faible disponibilité énergétique chez les athlètes féminines. Médecine physique et réadaptation. Medscape. 2016.

[12]. Dusek, T. (2001). Influence of high intensity training on menstrual cycle disorders in athletes. Croatian Medical Journal, 42(1), 79-82.https://doi.org/10.1177/1941738112439685

[13]. Rickenlund, A., Thorén, M., Carlström, K., von Schoultz, B., & Hirschberg, A. L. (2004). Diurnal profiles of testosterone and pituitary hormones suggest different mechanisms for menstrual disturbances in endurance athletes. The Journal of Clinical Endocrinology and Metabolism, 89(2), 702-707. https://doi.org/10.1210/jc.2003-030306

[14]. Hagovska M, Švihra J, Buková A, Hrobacz A, Dračková D, Švihrová V, et al. Prevalence of urinary incontinence in females performing high-impact exercises. Int J Sports Med. 2017;38(3):210–6.

[15]. Carvalhais A, Natal Jorge R, Bø K. Performing high-level sport is strongly associated with urinary incontinence in elite athletes: A comparative study of 372 elite female athletes and 372 controls. Br J Sports Med. 2018;52(24):1586–90.

[16]. Caylet, N., Fabbro-Peray, P., Marès, P., Dauzat, M., Prat-Pradal, D., & Corcos, J. (2006). Prevalence and occurrence of stress urinary incontinence in elite women athletes. The Canadian Journal of Urology, 13(4), 3174-3179.

[17]. Araujo MP de, Parmigiano TR, Negra LG Della, Torelli L, Carvalho CG de, Wo L, et al. Avaliação do assoalho pélvico de atletas: Existe relação com a incontinência urinária? Rev Bras Med do Esporte. 2015;21(6):442–6.

[18]. Sundgot-Borgen J, Sundgot-Borgen C, Myklebust G, Sølvberg N, Torstveit MK. Elite athletes get pregnant, have healthy babies and return to sport early postpartum. BMJ Open Sport Exerc Med. 2019;5(1):e000652

[19]. Sigurdardottir T, Steingrimsdottir T, Geirsson RT, Halldorsson TI, Aspelund T, Bø K. Do female elite athletes experience more complicated childbirth than non-athletes? A case-control study. Br J Sports Med. 2019;53(6):354–8.

[20]. Bø K, Artal R, Barakat R, Brown W, Davies GAL, Dooley M, et al. Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne. Part 1-exercise in women planning pregnancy and those who are pregnant. In: British Journal of Sports Medicine. BMJ Publishing Group; 2016. p. 571–89.

[21]. Daley, A. J., Foster, L., Long, G., Palmer, C., Robinson, O., Walmsley, H., & Ward, R. (2015). The effectiveness of exercise for the prevention and treatment of antenatal depression : Systematic review with meta-analysis. BJOG: An International Journal of Obstetrics and Gynaecology, 122(1), 57-62.