

Anorexia nervosa: COVID-19 pandemic period (Review)

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Abstract. Anorexia nervosa is an eating disorder characterized by restrictive eating and an intense fear of gaining weight. It is a disease with an increasing incidence during the last few decades, and represents a complex psychiatric condition which includes secondary amenorrhea, nutritional and metabolic damage, and impaired endocrine panel up to bone loss as well as cardiac, gastrointestinal and hematological complications. This is a narrative review which includes an update on this eating disorder from the perspective of an endocrine panel of anomalies, especially of the skeleton, considering the pressure of the recent global COVID-19 pandemic changes. Practically affecting every organ, anorexia nervosa needs to be taken into consideration during the pandemic period because of the higher risk of relapse due to new living conditions, social distancing, self-isolation, changes in food access, more intense use of social media platforms, disruption of daily habits, and more difficult access to healthcare practitioners. The lack of physical activity in addition to vitamin D deficiency related to low sun exposure or to the use of facial masks may also be connected to further bone damage related to this disease.

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1. Introduction

Anorexia nervosa, an eating disorder characterized by restrictive eating and an intense fear of gaining weight, is a complex condition which includes psychiatric anomalies, secondary amenorrhoea, nutritional damage, impaired endocrine panel up to bone loss as well as cardiac, gastrointestinal, and hematological complications (1,2). Every organ actually may be affected by the disease; thus, there is a need for a multidisciplinary team in addition to multiple hospitalization episodes (1,2). Not only long term requirements but also a high mortality rate is described in relation to malnutrition and weight loss (2,3).

Eating disorders such as anorexia nervosa have exhibited an alarming increasing incidence due to social pressure especially through social media (3-5). This increasing incidence has been reported for the last few decades but especially during the last 6 months of 2020 when it has become a challenging issue due to the pandemic period (6,7) Lockdown recommendations refocused the population on viral content which aggressively imposed unrealistic models of weight and body image (6,7). The two major features of the condition may be characterized as a life threatening situation with side effects affecting each body system with an alarming increasing incidence (1,4).

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Abbreviations: CIES, COVID isolation eating scale; IGF1-1, insulin-like growth factor-1

Key words: anorexia nervosa, amenorrhea, fracture, osteoporosis, COVID-19

2. Aim of the review

This is a review which includes an update on the eating disorder anorexia nervosa from three perspectives: The gynecological endocrine panel of anomalies, damage to bone status, and the pressure of recent global pandemic transformations on subjects who display the condition.

3. Research method

This is a narrative review. The most explored database was Pub Med. A number of 54 references are quoted. We found 12 reports strictly related to anorexia nervosa and COVID-19 infection.

4. Panel of endocrine changes in anorexia nervosa

Psychiatric components of anorexia nervosa involving body image anomalies, damaging behaviors in order to promote weight loss (more than 15% reduction of the ideal body weight or a body mass index less than 17.5 kg/m²) are associated with secondary amenorrhea which underlines central hypogonadism (8,9).

In addition to this, other endocrine anomalies including hypothyroxinemia, hypercorticism, low insulin-like growth factor-1 (IGF1-1) production and hypoleptinemia have been reported (8,9). The loss of fat tissue due to a hypercatabolic status acts as an endocrine disruptor, also impairing communication with the hypothalamus-pituitary-thyroid, respective adrenal, and ovarian axes (8-10). This connection is translated in clinical practice; for instance at least 20.5% body fat mass is needed in order to achieve menstruation in young adult females (11). These pathways are supplementary destroyed by stress (for example, the new worldwide pandemic), which represents an epigenetic factor in anorexia nervosa (8).

Neuroendocrine pathways are also disrupted in this disease since there is miscommunication between brain-gut-adipose tissue, and anomalies of peptides underlying satiety and appetite regulation may act as disruptors of these pathways (12,13). Anorexia nervosa is a life threatening situation while endocrine, nutritional and electrolytic deterioration expose the patient to additional risks, including infections or cardiovascular diseases (14-16).

To date, there is a paucity of literature data regarding the specific risk of COVID-19 infection to anorexic patients. This complex psychiatric disease is very well studied but the exact link between metabolic and neuroendocrine changes are not completely understood up to the present (17).

5. Bone status

Fat tissue loss and dysfunction due to massive weight loss causes bone deterioration in addition to nutritional disturbances and endocrine/metabolic complications (18,19). Extreme phenotypes of anorexia nervosa are characterized by liver dysfunction, anemia, thrombocytopenia, leucopenia, bradycardia, hypoglycemia, and low vitamin D and calcium levels (18,19). Deficiency in estrogen levels decreases bone mineral density (as seen in menopausal status or in young females with other causes of hypogonadism such as

premature ovarian failure) (20,21). However, estrogen replacement therapy does not entirely restore bone mineral density values because of the fact that other mechanisms in addition to estrogens are also involved in the skeleton status. Thus include: Chronic inflammation [for example, higher levels of pro-inflammatory cytokine tumor necrosis factor (TNF) have been reported], high cortisol values, anomalies of leptin (such as low circulating levels or high soluble leptin receptor levels) and of adiponectin, impaired bone-gut-fat communication and abnormal variations of bone turnover markers (22,23). Constant exposure to high oxidative status and dysregulation of the gut microbiota represent other contributors to skeleton status damage (24,25).

Moreover, most cases of anorexia have an onset during puberty thus the acquisition of peak bone mass is impaired as well as linear growth (26,27). Weight correction may be accompanied by catch up growth (but not always) while reaching the maximum potential of peak bone mass (which is 20-40% influenced by lifestyle intervention) is less likely to be entirely recovered (28,29). A total of 90% of women with anorexia nervosa have low bone mineral density more than 1 standard deviation below the values for age-matched healthy women (28,30).

Premenopausal osteoporosis represents a common co-morbidity in this particular type of eating disorder (31,32). The pharmacological intervention consists in the resumption of menses by estrogen use (33,34). The use of bisphosphonates is controversial due to the fact that there is a limited number of available studies as well as the potential harmful effect of these drugs on future pregnancy (35,36). Some cases treated with teriparatide have been reported for severe cases of osteoporosis (31).

Thus, since the anti-osteoporotic approach with medicine is not consistent, the importance of lifestyle intervention is reflected in weight gain and providing adequate levels of vitamin D and calcium (37,38). Low sun exposure (which may be seen during lockdown restrictions) or the use of facial masks may impair adequate vitamin D intake during the pandemic period.

6. COVID-19 and anorexia nervosa

A recent 2020 study of the early COVID-19 effects on individuals with eating disorders based on self-reports reported associated increased anxiety and alarming eating behaviors during the pandemic (6). More than 1,000 participants from the US and The Netherlands answered online questions related to COVID-19 (6). A total of 62%, respective 69% of the individuals had anorexia nervosa and they experienced worries about their dietary schedules while subjects with bulimia nervosa or binge eating disorders reported more episodes of binging when compare to the pre-pandemic period (6). The use of tele-medicine may bring some kind of improvement to these issues based on this survey (6).

Another UK survey which also used online data found a negative impact of the pandemic on subjects with eating disorders (39). The study was conducted on 129 subjects aged between 16 and 65 years (39). The following issues need to be taken into consideration: New living conditions, social distancing, self-isolation, changes in food access, more intense use of social media platforms, disruption of daily habits, and

more difficult access to healthcare practitioners (39). Early pandemic data showed that coronavirus disease restrictions (not the disease itself) impaired the access to eating disorder services while changes of routine activities brought supplementary stress to the subjects (40).

A controlled study from China, based on the observations of eating disorder caregivers, showed a higher rate of depression and anxiety on 254 patients vs. a control group of 254 healthy subjects (41). Among persons with anorexia nervosa, the subgroup at higher risk included subjects with a longer period of time since diagnosis, and those with close relatives who did not live with them (41).

Longitudinal data were collected before and during lockdown on 74 patients with anorexia nervosa or bulimia vs. 97 healthy control subjects using questionnaires (42). While bulimic individuals exacerbated binge eating behaviors, anorexic patients were associated with an increased compensatory physical exercise, and patients with both conditions had more frequent episodes of relapse during the pandemic outbreak if the condition was previously remitted (42). Early data from the COLLATE (COVID-19 and you: Mental health in Australia now survey) project studied 5,469 participants from the Australian population with eating disorders and found excessive purging and bingeing behaviors (43).

The transition to telehealth was brought by global changes due to infection with the novel coronavirus and many medical domains switched their daily clinical program to online practice (44,45). The level of interest from the general population was found to depend on pathology, geographic area or the moment of lockdown (45,46). This adjustment was also conducted for providing health care to patients with eating disorders (44). Some utility of the novel system has been confirmed (44). Nutritional recommendations through telehealth are also used for subjects without anorexia nervosa (47). Since physiological support in eating diseases also includes sessions with the entire family, family-based therapy using videoconferencing was also recommended during the pandemic period, but we should mention that this online method of gathering the entire family has been previously suggested (48,49).

Another observation, although with a relatively low level of evidence, is the potential association of eating disorders with a higher risk of suicide (50,51). Moreover, low weight and impaired immunity may represent negative factors for COVID-19 infection itself (52).

A study on 159 subjects with anorexia nervosa showed a 37% decrease in access to in-person physiological/psychotherapy control and a 46% reduction in general practitioner check-ups while videoconferencing was used by 26% of patients, and 35% of them had a telephone consultation (53). COVID Isolation Eating Scale (CIES) was launched in September 2020 representing a collaborative international study aiming to explore the pandemic impact on subjects with eating disorders and obesity (54). Among the different subgroups, anorexic patients had the highest level of dissatisfaction to remote therapy vs. prior face-to-face treatment (55).

Overall, the current pandemic day's prescription is marked by access through digital medicine. The access to investigations might be reduced but drug administration should not be postponed, if considered necessary. When it comes to therapy

options referring to low bone mineral density/osteoporosis in patients of reproductive age suffering anorexia nervosa, we mention first vitamin D supplements and adequate calcium intake if necessary (in addition to menses control) (55-57). Typical drugs used for menopausal osteoporosis such as anti-resorptives (bisphosphonates, denosumab) and bone-forming agents such as teriparatide are not encouraged in premenopausal women unless severe conditions such as prevalent osteoporotic fractures are exhibited since the potential harmful effect of future pregnancy is still a matter of discussion (56-58).

7. Conclusions

Anorexia nervosa, a severe condition affecting every organ of the body including bone status, needs to be taken into consideration during the COVID-19 pandemic period because of a higher risk of relapse associated with the new living conditions, social distancing, self-isolation, changes in food access, more intense use of social media platforms, disruption of daily habits, and more difficult access to healthcare practitioners. The lack of physical activity in addition to vitamin D deficiency related to low sun exposure or to the use of facial masks should also be considered when it comes to further bone damage.

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Authors' contributions

MCD critically revised the manuscript for its content. FS revised the manuscript and is the corresponding author. MC summarized the literature findings and wrote the manuscript. RCP revised the literature data. AAGG and AP researched the articles that were included as references. AV reviewed the literature findings and critically revised the manuscript and approved the current form of the article in order to be submitted to the journal. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

References

1. Cass K, McGuire C, Bjork I, Sobotka N, Walsh K and Mehler PS: Medical complications of anorexia nervosa. *Psychosomatics* 61: 625-631, 2020.
2. Brown C and Mehler PS: Medical complications of anorexia nervosa and their treatments: An update on some critical aspects. *Eat Weight Disord* 20: 419-425, 2015.
3. Westmoreland P, Krantz MJ and Mehler PS: Medical complications of anorexia nervosa and bulimia. *Am J Med* 129: 30-37, 2016.
4. Shuttleworth E, Sharma S, Lal S and Allan PJ: Medical complications of anorexia nervosa. *Br J Hosp Med (Lond)* 77: 287-293, 2016.
5. Alsayed N, Eldabi T, Lee H, Kamel DM and Tantawy SA: Weight-related behaviours in Bahraini adolescent friendship networks: Exploring the moderating role of friendship network properties. *Arch Balk Med Union* 55: 388-397, 2020.
6. Termorshuizen JD, Watson HJ, Thornton LM, Borg S, Flatt RE, MacDermid CM, Harper LM, van Furth EF, Pea TC and Bulik CM: Early impact of COVID-19 on individuals with self-reported eating disorders: A survey of ~1,000 individuals in the United States and the Netherlands. *Int J Eat Disord* 53: 1780-1790, 2020.
7. Haripersad YV, Kannegiesser-Bailey M, Morton K, Skeldon S, Shipton N, Edwards K, Newton R, Newell A, Stevenson PG and Martin AC: Outbreak of anorexia nervosa admissions during the COVID-19 pandemic. *Arch Dis Child* 106: e15, 2021.
8. Xiao Y, Liu D, Cline MA and Gilbert ER: Chronic stress and adipose tissue in the anorexic state: Endocrine and epigenetic mechanisms. *Adipocyte* 9: 472-483, 2020.
9. Poiana C, Chirita C, Carsote M, Hortopan D and Goldstein A: Galactoceles and prolactinoma-A pathogenic association? *Maturitas* 62: 98-102, 2009.
10. Epingeac ME, Gaman MA, Diaconu C, Gad M and Gaman AM: The evaluation of oxidative stress in obesity. *Rev Chim (Bucharest)* 70: 2241-2244, 2019.
11. Ayton A: The importance of restoring body fat mass in the treatment of anorexia nervosa: An expert commentary. *J Popul Ther Clin Pharmacol* 26: e9-e13, 2019.
12. Baranowska B and Kochanowski J: Neuroendocrine aspects of anorexia nervosa and bulimia nervosa. *Neuro Endocrinol Lett* 39: 172-178, 2018.
13. Sandru F, Carsote M, Albu SE, Valea A, Petca A and Dumitrascu MC: Glucagonoma: From skin lesions to the neuroendocrine component (Review). *Exp Ther Med* 20: 3389-3393, 2020.
14. Støvring RK: Mechanisms in endocrinology: Anorexia nervosa and endocrinology: A clinical update. *Eur J Endocrinol* 180: R9-R27, 2019.
15. Diaconu C: Treatment of diabetes in patients with heart failure. In: *The 3rd International Conference on Interdisciplinary Management of Diabetes Mellitus and its Complications-Diabetes mellitus in Internal Medicine, INTERDIAB 2017 Proceedings*. Serafinceanu C, Negoita O and Elian V (eds). Niculescu, Bucharest, pp170-177, 2017.
16. Gaman MA, Dobrica EC, Pascu EG, Cozma MA, Epingeac ME, Gaman AM, Pantea Stoian AM, Bratu OG and Diaconu CC: Cardiometabolic risk factors for atrial fibrillation in type 2 diabetes mellitus: Focus on hypertension, metabolic syndrome and obesity. *J Mind Med Sci* 6: 157-161, 2019.
17. Viltart O, Duriez P and Tolle V: Metabolic and neuroendocrine adaptations to undernutrition in anorexia nervosa: From a clinical to a basic research point of view. *Horm Mol Biol Clin Investig* 36, 2018 doi: 10.1515/hmbci-2018-0010.
18. Gibson D, Watters A, Cost J, Mascolo M and Mehler PS: Extreme anorexia nervosa: Medical findings, outcomes, and inferences from a retrospective cohort. *J Eat Disord* 8: 25, 2020.
19. Radu L, Carsote M, Gheorghisan-Galateanu AA, Preda SA, Calborean V, Stanescu R, Gheorman V and Albulescu DM: Blood parathyroid and mineral metabolism dynamics. A clinical analysis. *Rev Chim (Bucharest)* 69: 2754-2758, 2018.
20. DeLoughery EP and Dow ML: Decreased bone mineral density and reproductive axis dysfunction: More than oestrogen. *Neth J Med* 78: 50-54, 2020.
21. Albulescu DM, Carsote M, Ghemigian A, Popescu M, Predescu AM, Tuculina MJ, Bugala AS, Bataiosu M, Marinescu RI, Dascalu IT, *et al*: Circulating 25-hydroxycholecalciferol in relationship to central dual-energy X-ray absorptiometry assesses. A clinical study. *Rev Chim (Bucharest)* 69: 3683-3687, 2018.
22. Carsote M, Preda SA, Mitroi M, Camen A and Radu L: Serum osteocalcin, PINP, alkaline phosphatase, and crosslaps in humans: The relationship with body mass index. *Rev Chim (Bucharest)* 70: 1615-1618, 2019.
23. Karageorgiou V, Furukawa TA, Tsigkaropoulou E, Karavia A, Gournellis R, Soureti A, Bellos I, Douzenis A and Michopoulos I: Adipokines in anorexia nervosa: A systematic review and meta-analysis. *Psychoneuroendocrinology* 112: 104485, 2020.
24. Albulescu DM, Carsote M, Ionovici N, Ghemigian A, Popescu M, Tuculina MJ, Dascalu IT, Preda SA, Tircu T, Petrescu MS, *et al*: 5-Hydroxytryptamine and skeleton influence clinical study. *Rev Chim (Bucharest)* 69: 2438-2442, 2018.
25. Gibson D and Mehler PS: Anorexia nervosa and the immune system-A narrative review. *J Clin Med* 8: 1915, 2019.
26. Modan-Moses D, Yaroslavsky A, Pinhas-Hamiel O, Levy-Shraga Y, Kochavi B, Iron-Segev S, Enoch-Levy A, Toledano A and Stein D: A prospective longitudinal assessment of linear growth and adult height in female adolescents with anorexia nervosa. *J Clin Endocrinol Metab* 106: e1-e10, 2020.
27. Weaver CM, Gordon CM, Janz KF, Kalkwarf HJ, Lappe JM, Lewis R, O'Karma M, Wallace TC and Zemel BS: The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors: A systematic review and implementation recommendations. *Osteoporos Int* 27: 1281-1386, 2016.
28. Legroux I and Cortet B: Factors influencing bone loss in anorexia nervosa: Assessment and therapeutic options. *RMD Open* 5: e001009, 2019.
29. Fazeli PK and Klibanski A: Effects of anorexia nervosa on bone metabolism. *Endocr Rev* 39: 895-910, 2018.
30. Fazeli PK: Low bone mineral density in anorexia nervosa: Treatments and challenges. *Clin Rev Bone Miner Metab* 17: 65-76, 2019.
31. Drabkin A, Rothman MS, Wassenaar E, Mascolo M and Mehler PS: Assessment and clinical management of bone disease in adults with eating disorders: A review. *J Eat Disord* 5: 42, 2017.
32. Pepe J, Body JJ, Hadji P, McCloskey E, Meier C, Obermayer-Pietsch B, Palermo A, Tsourdi E, Zillikens MC, Langdahl B and Ferrari S: Osteoporosis in premenopausal women: A clinical narrative review by the ECTS and the IOF. *J Clin Endocrinol Metab* 105: dgaa306, 2020.
33. Khan A: Premenopausal women and low bone density. *Can Fam Physician* 52: 743-747, 2006.
34. Schorr M and Klibanski A: Anorexia nervosa and bone. *Curr Opin Endocrinol Metab Res* 3: 74-82, 2018.
35. Steinman J and Shibli-Rahhal A: Anorexia nervosa and osteoporosis: Pathophysiology and treatment. *J Bone Metab* 26: 133-143, 2019.
36. Mehler PS: Clinical guidance on osteoporosis and eating disorders: The NEDA continuing education series. *Eat Disord* 27: 471-481, 2019.
37. Nakamura Y, Kamimura M, Koiwai H and Kato H: Adequate nutrition status important for bone mineral density improvement in a patient with anorexia nervosa. *Ther Clin Risk Manag* 14: 945-948, 2018.
38. Giollo A, Idolazzi L, Caimmi C, Fassio A, Bertoldo F, Dalle Grave R, El Ghoch M, Calugi S, Bazzani PV, Viapiana O, *et al*: Vitamin D levels strongly influence bone mineral density and bone turnover markers during weight gain in female patients with anorexia nervosa. *Int J Eat Disord* 50: 1041-1049, 2017.
39. Branley-Bell D and Talbot CV: Exploring the impact of the COVID-19 pandemic and UK lockdown on individuals with experience of eating disorders. *J Eat Disord* 8: 44, 2020.
40. Bryan DC, Macdonald P, Ambwani S, Cardi V, Rowlands K, Willmott D and Treasure J: Exploring the ways in which COVID-19 and lockdown has affected the lives of adult patients with anorexia nervosa and their careers. *Eur Eat Disorders Rev* 28: 826-835, 2020.
41. Guo L, Wu M, Zhu Z, Zhang L, Peng S, Li W, Chen H, Fernández-Aranda F and Chen J: Effectiveness and influencing factors of online education for caregivers of patients with eating disorders during COVID-19 pandemic in China. *Eur Eat Disord Rev* 28: 816-825, 2020.
42. Castellini G, Cassioli E, Rossi E, Innocenti M, Gironi V, Sanfilippo G, Felciai F, Monteleone AM and Ricca V: The impact of COVID-19 epidemic on eating disorders: A longitudinal observation of pre versus post psychopathological features in a sample of patients with eating disorders and a group of healthy controls. *Int J Eat Disord* 53: 1855-1862, 2020.

43. Phillipou A, Meyer D, Neill E, Tan EJ, Toh WL, Van Rheenen TE and Rossell SL: Eating and exercise behaviors in eating disorders and the general population during the COVID-19 pandemic in Australia: Initial results from the COLLATE project. *Int J Eat Disord* 53: 1158-1165, 2020.
44. Datta N, Derenne J, Sanders M and Lock JD: Telehealth transition in a comprehensive care unit for eating disorders: Challenges and long-term benefits. *Int J Eat Disord* 53: 1774-1779, 2020.
45. Hong YR, Lawrence J, Williams D Jr and Mainous A III: Population-level interest and telehealth capacity of US hospitals in response to COVID-19: Cross-sectional analysis of google search and national hospital survey data. *JMIR Public Health Surveill* 6: e18961, 2020.
46. Wosik J, Fudim M, Cameron B, Gellad ZF, Cho A, Phinney D, Curtis S, Roman M, Poon EG, Ferranti J, *et al*: Telehealth transformation: COVID-19 and the rise of virtual care. *J Am Med Inform Assoc* 27: 957-962, 2020.
47. Mehta P, Stahl MG, Germone MM, Nagle S, Guigli R, Thoma J, Shull M and Liu E: Telehealth and nutrition support during the COVID-19 pandemic. *J Acad Nutr Diet* 120: 1953-1957, 2020.
48. Matheson BE, Bohon C and Lock J: Family-based treatment via videoconference: Clinical recommendations for treatment providers during COVID-19 and beyond. *Int J Eat Disord* 53: 1142-1154, 2020.
49. Anderson KE, Byrne CE, Crosby RD and Le Grange D: Utilizing Telehealth to deliver family-based treatment for adolescent anorexia nervosa. *Int J Eat Disord* 50: 1235-1238, 2017.
50. Shah M, Sachdeva M and Johnston H: Eating disorders in the age of COVID-19. *Psychiatry Res* 290: 113122, 2020.
51. Carvalho PMM, Moreira MM, de Oliveira MNA, Landim JMM and Neto MLR: The psychiatric impact of the novel coronavirus outbreak. *Psychiatry Res* 286: 112902, 2020.
52. Walsh O and McNicholas F: Assessment and management of anorexia nervosa during COVID-19. *Ir J Psychol Med* 37: 187-191, 2020.
53. Schlegl S, Maier J, Meule A and Voderholzer U: Eating disorders in times of the COVID-19 pandemic-Results from an online survey of patients with anorexia nervosa. *Int J Eat Disord* 53: 1791-1800, 2020.
54. Fernández-Aranda F, Munguía L, Mestre-Bach G, Steward T, Etxandi M, Baenas I, Granero R, Sánchez I, Ortega E, Andreu A, *et al*: COVID isolation eating scale (CIES): Analysis of the impact of confinement in eating disorders and obesity-A collaborative international study. *Eur Eat Disorders Rev* 28: 871-883, 2020.
55. Paskins Z, Crawford-Manning F, Bullock L and Jinks C: Identifying and managing osteoporosis before and after COVID-19: Rise of the remote consultation? *Osteoporos Int* 31: 1629-1632, 2020.
56. Radu L, Carsote M, Predescu AM, Tenea Cojan TS, Socca B, Baleanu VD, Popescu M, Ionovici N and Albulescu DM: Biochemical parameters in patients using teriparatide. *Rev Chim (Bucharest)* 69: 3483-3485, 2018.
57. Yu EW, Tsourdi E, Clarke BL, Bauer DC and Drake MT: Osteoporosis management in the era of COVID-19. *J Bone Miner Res* 35: 1009-1013, 2020.
58. Rozenberg S, Bruyère O, Bergmann P, Cavalier E, Gielen E, Goemaere S, Kaufman JM, Lapauw B, Laurent MR, De Schepper J and Body JJ: How to manage osteoporosis before the age of 50. *Maturitas* 138: 14-25, 2020.