Public Health 224 (2023) 45–50

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Original Research

A nationwide case–control study on cardiovascular and respiratory-related disorders in patients with gambling disorder in Sweden

Y. Abdul Rahim [a, b, c, *], F. Fernandez-Aranda [d, e, f, g], S. Jimenez-Murcia [d, e, f, g], A. Håkansson [b, c]

[a] Helsingborg Hospital, Skåne Region, Helsingborg, Sweden
[b] Malmö Addiction Center, Clinical Research Unit, Skåne Region, Malmö, Sweden
[c] Department of Clinical Sciences Lund, Psychiatry, Faculty of Medicine, Lund University, Lund, Sweden
[d] CIBER Fisiopatología Obesidad y Nutrición (CIBERobn), Instituto de Salud Carlos III, Barcelona, Spain
[e] Department of Psychiatry, University Hospital of Bellvitge-IDIBELL, L'Hospitalet de Llobregat, Spain
[f] Department of Clinical Sciences, School of Medicine and Health Sciences, University of Barcelona, L'Hospitalet de Llobregat, Spain
[g] Psychoneurobiology of Eating and Addictive Behaviors Group, Neurosciences Program, Bellvitge Biomedical Research Institute (IDIBELL), L'Hospitalet de Llobregat, Spain

ARTICLE INFO

Article history:
Received 19 April 2023
Received in revised form
10 August 2023
Accepted 11 August 2023
Available online 14 September 2023

Keywords:
Pathological gambling
Gambling disorder
Cardiovascular disorders
Respiratory-related disorders
Diabetes
Obesity
Case-control study

ABSTRACT

Objectives: We aimed to examine potential relationships and gender differences between cardiovascular disease (CVD), diabetes, obesity, respiratory-related disorders, and gambling disorder (GD). We hypothesized that (1) GD patients would be more likely than controls to have CVD, diabetes, obesity, and respiratory-related diseases; and (2) females with GD would be more likely than men with GD to have CVD, diabetes, obesity, and respiratory-related diseases.
Study design: National retrospective case–control study.
Methods: We used data from the Swedish National Board of Health and Welfare between 2005 and 2019. A total of 10,766 patients were included, and 3592 of them had GD. Every GD patient was matched with two age- and gender-matched controls. Patient data, including the history of medical diagnoses, were extracted. Descriptive statistics, Chi-squared and Fisher's exact tests were used to compare GD patients and controls.
Results: GD patients had a higher prevalence of CVD and respiratory-related disorders than controls. Diabetes rates were 5% for GD patients and 2% for controls; CVD (18% vs 12%); respiratory-related disease (7% vs 4%); and obesity (7% vs 3%). Women with a diagnosis of GD have a higher prevalence of obesity and somatic comorbidities other than diabetes compared to men.
Conclusions: This is the largest case–control study conducted to date showing GD patients have a higher prevalence of CVD, diabetes, obesity, and respiratory-related disorders than controls. Women with GD appear to be more susceptible than men to CVD, obesity, and respiratory-related disorders; however, this may be partially explained by differences in help-seeking behavior. Thus, our findings highlight the importance of early identification of GD patients who may also have somatic conditions requiring treatment. This can be accomplished by implementing a screening program for GD, CVD, diabetes, obesity, and respiratory-related disorders, and by including healthy lifestyle management strategies.

Introduction

According to the DSM-5 (The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), gambling disorder (GD) is a psychiatric condition classified as an addictive disorder.[1] Approximately 0.6% of the adult population in Sweden has GD, while another 3.6% are at risk.[2] In Norway, 1.4% of the adult population have problem gambling, while in other European countries, it

* Corresponding author. Malmö Addiction Center, Södra Tullgatan 4, floor 6, Malmö 205 02, Sweden. Tel.: +46 73 783 77 40.
E-mail addresses: yassir.abdul_rahim@med.lu.se (Y. Abdul Rahim), ffernandez@bellvitgehospital.cat (F. Fernandez-Aranda), susanajimenez@ub.edu (S. Jimenez-Murcia), anders_c.hakansson@med.lu.se (A. Håkansson).

https://doi.org/10.1016/j.puhe.2023.08.018

ranges between 0.12% and 3.4%.[3] Worldwide, the prevalence of problem gambling is estimated to range from 0.5% to 7.6%.[4] A Swedish population study found that approximately 32% of men and 21% of women aged 16 to 84 years had gambled in the previous month. Adult gamblers aged 45–84 years are considered the most active, with approximately 34% engaging in regular gambling.[5] However, problem gambling remains most prevalent among Swedish younger adults aged 25–44 years, being 1.9% of the population.[2]

Only up to 20% of patients diagnosed globally with GD seek help for their gambling problems.[6] Hofmarcher et al. found that, in Sweden, only 10% of problem gamblers sought treatment.[7] Håkansson et al. demonstrated that only 20% of patients seeking GD treatment in Sweden are women, and Miller et al. examined clinical differences in GD treatment-seeking Swedish men and women.[8,9] Men seeking treatment were found to be five years younger than women, to have begun gambling 10 years earlier, and to have exhibited problematic gaming behavior for two years longer. Women also developed GD faster than men, despite having gambled for a shorter period. In addition, Syvertsen et al. showed that women who played electronic gaming machines progressed to high-risk gambling faster compared to men.[3]

Psychiatric comorbidities are common and well-studied in patients with GD.[10–13] According to a large national register study conducted in Sweden, 73% had a comorbid diagnosis in addition to GD, with anxiety and affective disorders among the most prevalent. Furthermore, they reported that women are more likely than men to have psychiatric comorbidities such as depression and anxiety. However, in their study, no gender differences were found in relation to substance use disorders.[14]

Gambling may predate and contribute to the development of physical illnesses such as cardiovascular disease (CVD), diabetes, obesity, and respiratory-related diseases. Butler et al. reported that those with problem gambling had higher odds of a poor diet, low physical exercise, and poor general health compared to non-problem gamblers.[15] The reason behind this could be that gamblers, especially online gambling, lack time for physical activity and therefore develop poorer somatic health over time compared to non-gamblers. Pathophysiological changes, such as an increased heart rate and higher levels of noradrenergic metabolites, could also be a potential explanation for the association between GD and CVD.[16,17] In addition, Grant and Potenza demonstrated that patients with GD have elevated anxiety levels.[18] Different confounding risk factors, including lipid status, hypertension, and tobacco use, may also account for the association between GD and CVD.[19] One study by Potenza et al. reported that the stress associated with gambling wins and losses may worsen cardiovascular conditions.[20] Previous studies have also reported associations between GD, CVD, and liver diseases.[19,21] Black et al. showed in their study that GD patients were more likely to be obese than controls (49% vs 28%, $P = .004$). Furthermore, patients with GD also had a higher prevalence of asthma/chronic lung disease (18% vs 10%, $P = .099$). However, no differences were found between GD group and controls regarding diabetes (7% vs 8%, $P = .693$).[22] While extant research has assessed psychiatric comorbidities in GD patients, there is a dearth of studies examining somatic health comorbidities such as CVD, diabetes, obesity, and respiratory-related diseases, and their relationship with GD. In addition, there are no studies comparing men and women with GD with respect to their somatic health.

The aim of this case–control study was to examine the association between CVD, diabetes, obesity, respiratory-related disorders, and lifetime GD. In addition, gender differences in somatic health in GD patients were investigated. We hypothesized that (1) GD patients would be more likely than controls to have CVD, diabetes, obesity, and respiratory-related diseases; and (2) females with GD would be more likely than men with GD to have CVD, diabetes, obesity, and respiratory-related diseases.[23]

Methods

Participants and recruitment procedure

This was a retrospective nationwide case–control study based on National Patient Register data retrieved from the Swedish National Board of Health and Welfare. The data retrieved included all patients over the age of 18 years with a diagnosis of GD in Swedish specialized healthcare (ICD-10 code F63.0, also known as 'pathological gambling') at any time between 2005 and 2019. Two gender- and age-matched control subjects were randomly selected from the general population using data from the Statistics Sweden population register for each patient with GD. In total, 11,067 patients were retrieved and assessed for eligibility from the registries. Patients in the control group who had a history of GD were not eligible for this study. After exclusion, the final sample consisted of 10,776 patients, of whom 3592 had a GD diagnosis, as shown in Fig. 1.

Measures

The physician records the diagnosis as an ICD-code in the patient's medical record. All ICD-codes from patients will be transferred automatically to the system. These ICD-codes can then be extracted from the National Patient Register based on inpatient and outpatient visits and used for research purposes. Based on these ICD-codes, the primary variables of this study are measured. CVD included hypertension diseases (ICD-10 codes I10–I15), ischemic heart diseases (I20–I25), diseases within lung circulation (I26–I28), other forms of heart diseases (I30–I52), cerebrovascular diseases (I60–I69), arterial diseases (I70–I79), and venous diseases (I80–I89). Respiratory-related diseases included the ICD-codes J40–J47. Furthermore, diabetes and obesity were defined as ICD-10 codes E10–E14 and E66, respectively.

Statistical analysis

All collected data were organized and analyzed in SPSS Statistics Version 28. The prevalence of CVD and respiratory-related disorders was compared between patients with GD and controls, as well as between genders, using Chi-squared and Fisher's exact tests. *P*-values <.05 were considered statistically significant.

Ethics

This study was approved by the Regional Ethical Review Board of Lund University (2019-01559) prior to its initiation and was conducted in accordance with the Declaration of Helsinki's ethical principles. The anonymity of patients was ensured by encoding data retrieved from the Swedish National Board of Health and Welfare.

Results

The present study included a total of 10,776 patients. The GD group comprised 2791 men (78%) and 801 women (22%) with a median age of 35 and 40 years, respectively, whereas the control group comprised 5581 men (78%) and 1603 women (22%) with a median age of 35 and 40 years, respectively (Table 1).

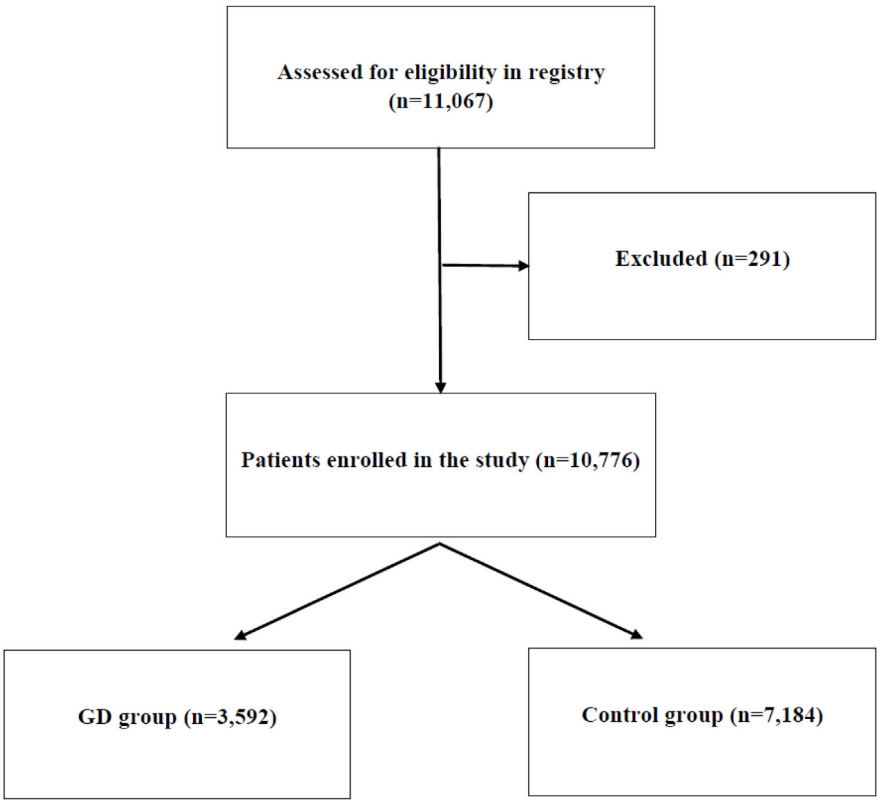

Fig. 1. Overview of the patient selection process.

Comparison between GD group and control group

As shown in Table 1, all CVD and respiratory-related disorders were significantly more prevalent in the GD group than in the control group. In the GD group, the prevalence of diabetes was three percent higher than in the control group, 5% vs 2%, respectively. Moreover, 18% of GD patients had CVD, compared to 12% of the control group. The prevalence of respiratory-related disease was greater in the GD group than in the control group. Accordingly, the prevalence of obesity was greater in the GD group than in the control group, 7% vs 3%, respectively.

Table 1
Characteristics and proportions of CVD and respiratory-related disorders at baseline for gambling disorder group (GD; F63.0) and control group between 2005 and 2019.

	GD group % (N)	Control group % (N)	*P*-value
Total	33 (3592)	67 (7184)	
Age (CI 95%, SD)	36 yrs (36–37, 12)	36 yrs (36–37, 12)	
Gender			
Male	78 (2791)	78 (5581)	.987
Female	22 (801)	22 (1603)	
CVD	18 (647)	12 (868)	***
Diabetes	5 (184)	2 (153)	***
Obesity	7 (239)	3 (200)	***
Respiratory-related diseases	7 (266)	4 (283)	***

*$P < .05$, **$P < .01$, ***$P < .001$.
CVD consisted of hypertension diseases (ICD-10 codes I10–I15), ischemic heart diseases (I20–I25), diseases within lung circulation (I26–I28), other forms of heart diseases (I30–I52), cerebrovascular diseases (I60–I69), arterial diseases (I70–I79), and venous diseases (I80–I89). Respiratory-related diseases included the ICD-codes J40–J47. Furthermore, diabetes and obesity were defined as ICD-10 codes E10–E14 and E66, respectively.

Comparison between genders in GD group and control group

In both the GD group and the control group, the prevalence of CVD and respiratory-related diseases, as well as obesity, was higher among women (Table 2). In contrast, there were no differences in the prevalence of diabetes between the two groups based on gender.

Discussion

The aim of this study was to compare CVD, diabetes, obesity, and respiratory-related disorders in GD patients and age- and gender-matched controls. This study contributes to a novel understanding of the prevalence of somatic comorbidities and obesity among patients with GDs, a topic that has received considerably less attention than alcohol or other substance use disorders. In addition, the relationship between GD and CVD, diabetes, obesity, and respiratory-related disorders, as well as gender differences, were investigated for the first time in the largest case–control study conducted to date.

As hypothesized, patients with GD had a higher prevalence of CVD, diabetes, obesity, and respiratory-related disorders compared to controls of the same age and gender from the general population. These results are consistent with those of previous research on the somatic health of gamblers, which found that pathological gamblers have a high prevalence of cardiovascular symptoms and conditions, with expected hypothesis of health worsening later in life, as found in other psychiatric disorders.[19–21,24,25] Black et al. explained that pathological gamblers are more likely to make poorer health-related lifestyle choices such as smoking, avoiding exercise, increasing food consumption, and eating junk food containing high levels of saturated fats and sugars, which could contribute to the development of somatic diseases such as CVD,

Table 2
Proportion of men's and women's CVD and respiratory-related disorders in the gambling disorder group (GD; F63.0) and control group between 2005 and 2019.

	GD group			Control group		
	Men % (N)	Women % (N)	*P*-value	Men % (N)	Women % (N)	*P*-value
Total	78 (2791)	22 (801)		78 (5581)	22 (1603)	
Age	35 yrs	40 yrs		35 yrs	40 yrs	
(CI 95%, SD)	(35–36, 11)	(40–41, 12)		(35–35, 11)	(40–41, 12)	
CVD	17 (466)	23 (181)	***	11 (612)	16 (256)	***
Diabetes	5 (134)	6 (50)	.103	2 (113)	3 (40)	.250
Obesity	4 (116)	15 (123)	***	2 (83)	7 (117)	***
Respiratory-related diseases	6 (165)	13 (101)	***	4 (204)	5 (79)	*

*$P < .05$, **$P < .01$, ***$P < .001$.
CVD consisted of hypertension diseases (ICD-10 codes I10–I15), ischemic heart diseases (I20–I25), diseases within lung circulation (I26–I28), other forms of heart diseases (I30–I52), cerebrovascular diseases (I60–I69), arterial diseases (I70–I79), and venous diseases (I80–I89). Respiratory-related diseases included the ICD-codes J40–J47. Furthermore, diabetes and obesity were defined as ICD-10 codes E10–E14 and E66, respectively.

diabetes, obesity, and respiratory-related disorders.[22] We also hypothesized that women would be more likely than men to have more CVD, diabetes, obesity, and respiratory-related disorders. This result is partly in concordance with previous studies, where it was found that whereas the coronary heart disease is higher in males, the CVD is higher in females, in the specific studied age range.[23,26] However, Nordstrom et al. found that the prevalence of type 2 diabetes was significantly higher in men than in women (14.6% vs 9.1%, $P < .001$).[27] In addition, Cooper et al. found that women have a higher prevalence of obesity than men worldwide (15% vs 11%).[28] Respiratory-related diseases such as asthma and COPD are more common in adult women than men.[29] As far as we are aware, no previous research has investigated the differences between genders in terms of GD and somatic health. However, studies on the differences in psychiatric disorders between men and women with GD have revealed that women have a higher risk of having a psychiatric disorder in conjunction with GD, but also more abnormal eating behavior (food addiction [FA]), and consequent increase body mass index (BMI), to cope with negative emotions.[12,30,31] The presence of FA in female GD (18.8% of cases) has been found to be associated with more gambling symptomatology, greater general psychopathology, more dysfunctional personality traits, less capacity to deal with emotions, and higher BMI.[30,32]

Our study highlights that little is known about the association between CVD, diabetes, obesity, and respiratory-related disorders in patients with GD. Moreover, our results indicate that, like psychiatric comorbidities, somatic comorbidities are more prevalent in GD patients compared to controls and in women compared to men, as the case of other psychiatric disorders.[25,33–35] This implies the need for health and social care professionals to early identify patients with GD who may additionally have somatic comorbidities that may need attention currently and later in life, with additional health and socio-economic burden. At this point in our knowledge, we believe that the implementation of a screening protocol could aid clinicians in the early detection of somatic conditions requiring further treatment and/or preventive interventions in patients with problem gambling or GD, in order to improve CVD, diabetes, obesity, and respiratory-related diseases, and introducing healthy lifestyles, nutritional advice, and management of sedentary behavior.[36] In addition, women appear to be more susceptible than men to psychiatric comorbidities and should therefore not be neglected and given special emphasis.

The present study is not without its limitations. One of the limitations of this study is that the data in the register was pre-collected and is based on ICD codes, which are registered diagnoses by health care providers and not the researcher. Moreover, register data occasionally lack essential information, such as information not reported to the register regarding diagnosis, and as a result, crucial information may be missing. Males and females approach assistance-seeking differently, which is another factor to consider. Women are more likely to seek help for mental health issues, according to previous research, and somatic symptoms and pathological gambling are no exception, which may explain why the prevalence of somatic comorbidities is lower in males than in females, as demonstrated by our findings.[37–39] A limitation of the study is that some of the patients are in the younger age range or have had their GD diagnosis for a short period of time; as a result, they have not had time to develop somatic conditions such as CVD or obesity and are therefore considered to be somatically healthy. Even though each GD patient in our study had two age- and gender-matched controls, we did not perform a matched analysis on the GD patients and their respective controls. This could have potentially introduced confounding variables into the study design and should have been accounted for in a matched analysis.

This study's inclusion of a large number of patients is one of its strengths. The register of individuals with GD used in this study is unique in that it includes all Swedish patients with a GD diagnosis. In addition, the inclusion of two controls of the same age and gender as the individual with GD is a strength.

Conclusions

CVD, diabetes, obesity, and respiratory-related disorders were more prevalent in GD patients than in the general population. The prevalence of somatic comorbidities and obesity is higher in women than in men. There were no differences in the prevalence of diabetes between two groups based on gender. This necessitates that health and social care professionals play a crucial role in identifying patients with GD who may also have somatic comorbidities requiring treatment or prevention. However, additional research is required to verify these results.

Author statements

Acknowledgements

The authors are grateful to the Swedish Board of Health and Welfare and the employees involved in the extraction of data from the national registry. FFA and SJM thank CERCA Programme/Generalitat de Catalunya for institutional support. CIBERobn is an initiative of ISCIII.

Ethical approval

This study was approved by the Regional Ethical Review Board of Lund University (2019-01559) prior to its initiation and was

conducted in accordance with the Declaration of Helsinki's ethical principles. The anonymity of patients was ensured by encoding data retrieved from the Swedish National Board of Health and Welfare.

Funding

No project-specific funding is allocated to this study. It was funded by the last author's general research funding from the Swedish state-owned gambling operator (AB Svenska Spel) and the regional health care service organization (Region Skåne). In no way were these organizations involved in the study.

Competing interests

Håkansson is a professor at Lund University, and his position at this university is financially supported by AB Svenska Spel, the state-owned gambling operator of Sweden. Also, he has obtained research funding from the independent research council of Svenska Spel, as well as from the corresponding research council of the state-owned Swedish alcohol monopoly, Systembolaget. FFA and SJM have received consultancy honoraria from Novo Nordisk and FFA editorial honoraria as EIC from Wiley. The remaining authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results. No specific funding was required for the conduct of the present study.

Author contributions

The authors confirm contribution to the paper as follows: study conception and design: YAR and AH; data collection: YAR; analysis and interpretation of results: YAR, FFA, SJM and AH; draft manuscript preparation: YAR. All authors reviewed the results and approved the final version of the manuscript.

References

1. Grant JE, Chamberlain SR. Expanding the definition of addiction: DSM-5 vs. ICD-11. *CNS Spectr* 2016;**21**:300–3.
2. Sweden PHAo. *Tabellsammanställning för Swelogs befolkningsstudie 2018. Table compilation for Swelog's population study 2018*. Public Health Agency of Sweden; 2021 [cited 2022 26 November]; Available from: https://www.folkhalsomyndigheten.se/contentassets/bbb42383175f41caa548975a4e3b92ea/tabellsammanstallning-swelogs-befolksningsstudie-2018.pdf.
3. Syvertsen A, Leino T, Pallesen S, Smith ORF, Mentzoni RA, Erevik EK. Telescoping and gender differences in high-risk gambling: loss limit behavior in a population of electronic gaming machine players. *Psychol Addict Behav* 2023;**37**:499–508.
4. Williams RJ, Volberg RA, Stevens RMG. The population prevalence of problem gambling: methodological influences, standardized rates, jurisdictional differences, and worldwide trends. *Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care* 2012 [cited 2023 27 July]; Available from: https://hdl.handle.net/10133/3068.
5. Sweden PHAo. *Tabellsammanställning för Swelogs prevalensstudie 2015. Table compilation for Swelog's prevalence study 2015*. Public Health Agency of Sweden; 2016 [cited 2022 26 November]; Available from: https://www.folkhalsomyndigheten.se/globalassets/livsvillkor-levnadsvanor/andts/spel/swelogs/tabellsammanstallning-swelogs-prevalensstudie-2015.pdf.
6. Bijker R, Booth N, Merkouris SS, Dowling NA, Rodda SN. Global prevalence of help-seeking for problem gambling: a systematic review and meta-analysis. *Addiction* 2022;**117**:2972–85.
7. Hofmarcher T, Romild U, Spångberg J, Persson U, Håkansson A. The societal costs of problem gambling in Sweden. *BMC Publ Health* 2020;**20**:1921.
8. Håkansson A, Mårdhed E, Zaar M. Who seeks treatment when medicine opens the door to pathological gambling patients-psychiatric comorbidity and heavy predominance of online gambling. *Front Psychiatr* 2017;**8**:255.
9. Miller L, Mide M, Arvidson E, Söderpalm Gordh A. Clinical differences between men and women in a Swedish treatment-seeking population with gambling disorder. *Front Psychiatr* 2022;**13**:1054236.
10. Granero R, Fernández-Aranda F, Pino-Gutierrez AD, Etxandi M, Baenas I, Gómez-Peña M, et al. The prevalence and features of schizophrenia among individuals with gambling disorder. *J Psychiatr Res* 2021;**136**:374–83.
11. Jiménez-Murcia S, Granero Pérez R, Fernández-Aranda F, Alvarez Moya E, Aymamí MN, Gómez-Peña M, et al. Comorbidity in pathological gambling: clinical variables, personality and treatment response. *Rev Psiquiatía Salud Ment* 2009;**2**:178–89.
12. Lemón L, Fernández-Aranda F, Jiménez-Murcia S, Håkansson A. Eating disorder in gambling disorder: a group with increased psychopathology. *J Behav Addict* 2021;**10**:540–5.
13. Vintró-Alcaraz C, Mestre-Bach G, Granero R, Caravaca E, Gómez-Peña M, Moragas L, et al. Exploring the association between gambling-related offenses, substance use, psychiatric comorbidities, and treatment outcome. *J Clin Med* 2022:11.
14. Håkansson A, Karlsson A, Widinghoff C. Primary and secondary diagnoses of gambling disorder and psychiatric comorbidity in the Swedish health care system-A nationwide register study. *Front Psychiatr* 2018;**9**:426.
15. Butler N, Quigg Z, Bates R, Sayle M, Ewart H. Gambling with your health: associations between gambling problem severity and health risk behaviours, health and wellbeing. *J Gambl Stud* 2020;**36**:527–38.
16. Meyer G, Hauffa BP, Schedlowski M, Pawlak C, Stadler MA, Exton MS. Casino gambling increases heart rate and salivary cortisol in regular gamblers. *Biol Psychiatr* 2000;**48**:948–53.
17. Roy A, Adinoff B, Roehrich L, Lamparski D, Custer R, Lorenz V, et al. Pathological gambling. A psychobiological study. *Arch Gen Psychiatr* 1988;**45**:369–73.
18. Grant JE, Potenza MN. Escitalopram treatment of pathological gambling with co-occurring anxiety: an open-label pilot study with double-blind discontinuation. *Int Clin Psychopharmacol* 2006;**21**:203–9.
19. Germain C, Vahanian A, Basquin A, Richoux-Benhaim C, Embouazza H, Lejoyeux M. Brief report: coronary heart disease: an unknown association to pathological gambling. *Front Psychiatr* 2011;**2**:11.
20. Potenza MN, Fiellin DA, Heninger GR, Rounsaville BJ, Mazure CM. Gambling: an addictive behavior with health and primary care implications. *J Gen Intern Med* 2002;**17**:721–32.
21. Morasco BJ, Pietrzak RH, Blanco C, Grant BF, Hasin D, Petry NM. Health problems and medical utilization associated with gambling disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychosom Med* 2006;**68**:976–84.
22. Black DW, Shaw M, McCormick B, Allen J. Pathological gambling: relationship to obesity, self-reported chronic medical conditions, poor lifestyle choices, and impaired quality of life. *Compr Psychiatr* 2013;**54**:97–104.
23. Mosca L, Barrett-Connor E, Wenger NK. Sex/gender differences in cardiovascular disease prevention: what a difference a decade makes. *Circulation* 2011;**124**:2145–54.
24. Erickson L, Molina CA, Ladd GT, Pietrzak RH, Petry NM. Problem and pathological gambling are associated with poorer mental and physical health in older adults. *Int J Geriatr Psychiatr* 2005;**20**:754–9.
25. Vintró-Alcaraz C, Baenas I, Lozano-Madrid M, Granero R, Ruiz-Canela M, Babio N, et al. Psychological and metabolic risk factors in older adults with a previous history of eating disorder: a cross-sectional study from the Predimed-Plus study. *Eur Eat Disord Rev* 2021;**29**:575–87.
26. O'Neil A, Scovelle AJ, Milner AJ, Kavanagh A. Gender/sex as a social determinant of cardiovascular risk. *Circulation* 2018;**137**:854–64.
27. Nordström A, Hadrévi J, Olsson T, Franks PW, Nordström P. Higher prevalence of type 2 diabetes in men than in women is associated with differences in visceral fat mass. *J Clin Endocrinol Metab* 2016;**101**:3740–6.
28. Cooper AJ, Gupta SR, Moustafa AF, Chao AM. Sex/gender differences in obesity prevalence, comorbidities, and treatment. *Curr Obes Rep* 2021;**10**:458–66.
29. Silveyra P, Fuentes N, Bauza DER. Sex and gender differences in lung disease. *Adv Exp Med Biol* 2021;**1304**:227–58.
30. Etxandi M, Baenas I, Munguía L, Mestre-Bach G, Granero R, Gómez-Peña M, et al. Clinical features of gambling disorder patients with and without food addiction: gender-related considerations. *J Gambl Stud* 2022;**38**:843–62.
31. Larsson L, Håkansson A. Mental illness and socio-economic situation of women and men diagnosed with gambling disorder (GD) in Sweden - nationwide case-control study. *PLoS One* 2022;**17**:e0274064.
32. Jiménez-Murcia S, Granero R, Wolz I, Baño M, Mestre-Bach G, Steward T, et al. Food addiction in gambling disorder: frequency and clinical outcomes. *Front Psychol* 2017;**8**:473.
33. Rosenbaum S, Stubbs B, Ward PB, Steel Z, Lederman O, Vancampfort D. The prevalence and risk of metabolic syndrome and its components among people with posttraumatic stress disorder: a systematic review and meta-analysis. *Metabolism* 2015;**64**:926–33.
34. Van der Kooy K, van Hout H, Marwijk H, Marten H, Stehouwer C, Beekman A. Depression and the risk for cardiovascular diseases: systematic review and meta analysis. *Int J Geriatr Psychiatr* 2007;**22**:613–26.
35. Vancampfort D, Hallgren M, Mugisha J, De Hert M, Probst M, Monsieur D, et al. The prevalence of metabolic syndrome in alcohol use disorders: a systematic review and meta-analysis. *Alcohol Alcohol* 2016;**51**:515–21.

36. Gierisch JM, Nieuwsma JA, Bradford DW, Wilder CM, Mann-Wrobel MC, McBroom AJ, et al. Pharmacologic and behavioral interventions to improve cardiovascular risk factors in adults with serious mental illness: a systematic review and meta-analysis. *J Clin Psychiatry* 2014;**75**:e424–40.
37. Barsky AJ, Peekna HM, Borus JF. Somatic symptom reporting in women and men. *J Gen Intern Med* 2001;**16**:266–75.
38. Oliver MI, Pearson N, Coe N, Gunnell D. Help-seeking behaviour in men and women with common mental health problems: cross-sectional study. *Br J Psychiatry* 2005;**186**:297–301.
39. Slutske WS, Blaszczynski A, Martin NG. Sex differences in the rates of recovery, treatment-seeking, and natural recovery in pathological gambling: results from an Australian community-based twin survey. *Twin Res Hum Genet* 2009;**12**:425–32.