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ONLINE BRAZILIAN JOURNAL OF NURSING
ISSN: 1676-4285

REVIEW ARTICLE

Risk factors related to obesity in adolescents in the face of the COVID-19 pandemic: a scoping review

Fatores de riscos relacionados à obesidade em adolescentes frente à pandemia da COVID-19: *scoping review*

Factores de riesgo relacionados con la obesidad en adolescentes ante la pandemia de COVID-19: *scoping review*

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Submission: 08/10/2021
Approved: 12/23/2021

ABSTRACT

Objective: to map the scientific evidence linking the risks of developing obesity in adolescents during the COVID-19 pandemic. **Method:** a scoping review as recommended by the Joanna Briggs Institute. The guiding question was as follows: What scientific evidence relates the risks of developing obesity in adolescents during the COVID-19 pandemic? The searches were carried out in five databases and in another three sources from the gray literature. Thus, 12 studies comprised the final sample. **Results:** the risk factors related to the development of obesity among adolescents during the COVID-19 pandemic are physical inactivity in daily living, fragility in psychological care, difficulty in nutritional education, and lack of body and complementary care measures. **Conclusion:** the risks related to adolescents' health during the COVID-19 pandemic are modifiable and Nursing plays an essential role for health promotion, disease prevention and encouraging the adoption of healthy habits.
Descriptors: Obesity; COVID-19; Nursing.

RESUMO

Objetivo: mapear as evidências científicas que relacionam os riscos de desenvolver obesidade em adolescentes na pandemia da COVID-19. **Método:** *scoping review* segundo recomendações do Instituto Joanna Briggs. A pergunta norteadora foi: quais as evidências científicas que relacionam os riscos de desenvolver obesidade em adolescentes na pandemia da COVID-19? As buscas foram realizadas em cinco bases de dados e outras três fontes pertencentes à literatura cinzenta. Assim, 12 estudos compuseram a amostra final. **Resultados:** os fatores de risco relacionados ao desenvolvimento da obesidade entre adolescentes durante a pandemia da COVID-19 são inatividade física de vida diária, fragilidade na atenção psicológica, dificuldade na educação nutricional, ausência de cuidados corporal e complementares. **Conclusão:** os riscos relacionados à saúde de adolescentes na pandemia da COVID-19 são modificáveis e a enfermagem desempenha função essencial para promoção da saúde, prevenção de agravos e estímulo à adoção de hábitos saudáveis.
Descritores: Obesidade; Covid-19; Enfermagem.

RESUMEN

Objetivo: mapear la evidencia científica que señala los riesgos de desarrollar obesidad de los adolescentes durante la pandemia de COVID-19. **Método:** *scoping review* según las recomendaciones del Instituto Joanna Briggs. La pregunta orientadora fue: ¿qué evidencia científica señala los riesgos de los adolescentes de desarrollar obesidad durante la pandemia de COVID-19? Las búsquedas se realizaron en cinco bases de datos y en otras tres fuentes pertenecientes a la literatura gris. La muestra final estuvo conformada por 12 estudios. **Resultados:** los factores de riesgo relacionados con el desarrollo de obesidad en adolescentes durante la pandemia de COVID-19 son: sedentarismo, deficiencia en la atención psicológica, falta de educación nutricional, falta de cuidado corporal y complementario. **Conclusión:** los riesgos relacionados con la salud de los adolescentes durante la pandemia de COVID-19 son modificables y la enfermería tiene un papel fundamental en la promoción de la salud, la prevención de enfermedades y el incentivo para la adopción de hábitos saludables.
Descriptores: Obesidad; Covid-19; Enfermería.

Cruz Neto J, Araújo AH, Sidrim AC, Sampaio RL, Santos RL. Risk factors related to obesity in adolescents in the face of the COVID-19 pandemic: a scoping review. Online Braz J Nurs [Internet]. 2022 [cited year month day];21 Suppl 2:e20226548. Available from: https://doi.org/10.17665/1676-4285.20226548

INTRODUCTION

The prevalence of people with obesity has increased. Worldwide, between 1980 and 2014, the proportion of obese people more than doubled[1]. In Brazil, the estimates regarding the prevalence of obesity increased from 15% to 18% from 2010 to 2014, in both genders[2].

Obesity is conceptualized as a socioenvironmental and food insecurity risk factor influenced by the ways of producing, selling and consuming food products, which causes serious public health problems[3].

Obesity is considered a potentiating factor for other diseases such as diabetes, hypertension, cancer and cardiovascular pathologies. Thus, discussing obesity in adolescents becomes relevant in order to support the clinical practice and give a new meaning to the care measures aimed at prevention and health promotion, within this population[4].

With the advent of the COVID-19 pandemic, the associations between the disease and obesity have become an object of discussion. However, the scarcity of related studies reveals direct implications regarding obesity and the risk for clinical manifestations of the severe forms of COVID-19[4].

Considerable increases in the Body Mass Index (BMI) of 432,302 individuals aged between 2 and 19 years old were identified during the course of the pandemic[5]. In addition, it was found that overweight or obesity among children and adolescents increased during the pandemic, with an 8.7% increase in those aged from 5 to 11 years old, 5.2% between the ages of 12 and 15 and 3.1% among young people aged between 16 and 17 years old[6].

There is a relationship between obesity and deterioration of the clinical presentation of COVID-19, which is due to the propensity to infections, risk of sepsis and mortality. Chronic inflammation in the body reduces immunity and deregulates functioning of the immune system, causing oxidative stress, endothelial dysfunction and cardiovascular abnormalities due to excess adipose tissue[4,7].

The epidemiological bulletin of the Ministry of Health, published in April 2021, found a high record of deaths due to Severe Acute Respiratory Syndrome (SARS) by COVID-19 in obese individuals, aged under 60 years old[8].

The adoption of a healthy lifestyle has become a global challenge due to social behaviors, especially when it comes to obesity caused by social isolation and also in the face of bullying suffered by the adolescents[9]. In this context, Nursing care promotes changes in attitudes and prevention of risk behaviors, especially in Primary Health Care[10]. Nurses perform education in health, stimulate interpersonal relationships and prevent health problems[11]. Therefore, it is essential that nurses recognize the risk factors for the development of obesity in adolescents in the face of the COVID-19 pandemic.

Given the relevance of the theme, in view of the knowledge gap on the topic, the objective is to map the risk factors for developing obesity in adolescents in the face of the COVID-19 pandemic.

METHOD

Type of study

This is a scoping review, based on the guidelines proposed by the Joanna Briggs Institute[12], following nine stages, namely: (1) title; (2) title and question development; (3) introduction; (4) inclusion criteria; (5) research strategy; (6) selection of evidence sources; (7) data extraction; (8) analysis of the evidence; and (9) presentation of the results. The scoping review protocol has been registered in the Open Science Framework (OSF) and can be accessed at the following link: https://osf.io/q4mdf/.

Methodological procedure

The Population, Concept and Context (PCC) method was applied to elaborate the research guiding question, namely: *Population: Adolescents; Concept: Risk factors for obesity during the COVID-19 pandemic; Context: COVID-19 pandemic.* Thus, the guiding question was defined as follows: "Which are the risk factors for developing obesity in adolescents in the face of the COVID-19 pandemic?"

Data sources

Two researchers conducted the research by means of a paired search, with consolidated data from November 2020 to April 2021, using the following Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS) and Medical Subject Headings (MeSH): *"adolescent", "Adolescent Behavior", "Adolescent Nutrition", "Adolescent Health", "Adolescent Health Services", "obesity", "obese", "obesity in adolescents",* "COVID-19*", "coronavirus infections".* Furthermore, in case of disagreement between the two researchers, a third researcher was consulted to reach a consensus.

The search was carried out in the following databases: *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS), *Base de Dados de Enfermagem* (BDENF), Web of Science (WoS), Medical Literature Analysis and Retrieval System Online (MEDLINE) via EBSCO Information Services, and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Regarding the gray literature, PUBMEDCOVID-19 was searched in two topics (reviews and meta-analyses, obesity and nutrition) or (child and obesity and nutrition); as well as *medRiv* with the following strategy: (*adolescent*) *OR* (*adolescent nutrition*) *AND* (*obesity*) *OR* (*obesity in adolescents*) *AND* (*COVID-19*) and the CAPES Theses and Dissertations Catalog.

Data collection

The inclusion criteria for each PCC method mnemonic were the following: Population (adolescents of both genders aged between 10 and 19 years old who were or were not vaccinated against COVID-19); Concept (obesity in adolescents during the COVID-19 pandemic); Context (during the COVID-19 pandemic). Full studies available, empirical qualitative and quantitative, theoretical-reflective studies, in Portuguese, English or Spanish and that answered the guiding question were also included.

Review studies were excluded. After applying the criteria, the articles selected were read in full, followed by the analysis of their references, in search of potential studies that could be incorporated. Figure 1 displays the search strategies conducted by the authors.

Furthermore, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist[13] was applied to the methodological quality of this study and presents the search and selection stages, as shown in Figure 2[14].

Data analysis and organization

The studies were reviewed by two researchers and, in case of divergence, a third evaluator was consulted. The data extracted from the studies were organized in tables, followed by the reference and pertinent information that answered the guiding question.

RESULTS

Of the twelve included studies, seven were found in MEDLINE, two in CINAHL and WoS, respectively, and one in MedRxiv. The number of studies per country was as follows: Italy (2), China (3), Spain (1), Chile (1), Sahrawi Arab Democratic Republic (1), South Korea (1), Ireland (1), Greece (1), and India (1), according to Figura 3.

The study population varied from 41[22] to 10,085[19,25]. The studies reveal the overweight and obesity trend in the female adolescent population, both in undergraduate and regular education[16]. In addition to that, there is a significant reduction in leisure time and an increase in physical inactivity and screen time[15,21-23,25].

Databases	Search strategy
LILACS	*(adolescente) OR (comportamento do adolescente) OR (nutrição do adolescente) OR (saúde do adolescente) OR (serviços de saúde do adolescente) AND (obesidade) OR (obeso) OR (obesidade em adolescente) AND (COVID-19) OR (infecções por coronavirus)*
BDENF	*(adolescente) OR (comportamento do adolescente) OR (nutrição do adolescente) OR (saúde do adolescente) OR (serviços de saúde do adolescente) AND (obesidade) OR (obeso) OR (obesidade em adolescente) AND (COVID-19) OR (infecções por coronavirus)*
WoS	*(TITLE-ABS-KEY (adolescent) OR (adolescent behavior) OR (adolescent nutrition) OR (adolescent health) OR (adolescent health services) AND (obesity) OR (obese) OR (obesity in adolescents) TITLE-ABS-KEY (COVID-19) OR (coronavirus infections)*
MEDLINE	*(adolescent) OR (adolescent behavior) OR (adolescent nutrition) OR (adolescent health) OR (adolescent health services) AND (obesity) OR (obese) OR (obesity in adolescents) AND (COVID-19) OR (coronavirus infections)*
CINAHL	*(adolescent) OR (adolescent behavior) OR (adolescent nutrition) OR (adolescent health) OR (adolescent health services) AND (obesity) OR (obese) OR (obesity in adolescents) AND (COVID-19) OR (coronavirus infections)*

Figure 1 – Search strategies applied in the databases referring to the research. Crato, CE, Brazil, 2021
Source: Prepared by the authors, 2021.

The unavailability of vegetables rich in vitamins C and polyphenols, fruit, fish, beans and olive oil in the diet increases the predisposition to obesity. Physical exercises that involve metabolic expenditure, aerobic training, coordination, endurance and agility are reinforced[17,18,23].

Increased food intake, reduced physical activity, sedentary lifestyle and weight gain were found to be risk factors that support development of obesity[26].

Predisposition to a sedentary lifestyle is high, and stress interferes negatively with weight gain. The main variables associated with the occurrence of weight gain were gender, stress, low physical activity and unbalanced diet. Low physical activity is a risk factor for obesity[16,19,21,24]. Biochemical monitoring is highlighted as an important protective factor[20].

Closed leisure spaces, health concerns, low motivation, excessive school work, too much time in a sitting position and lack of routine predisposed people to an increase in obesity[21].

Sleep interferes with the adolescents' metabolism. During the pandemic, they spent more than 3 h/day in front of electronic screens[15]. Increased body weight was correlated with snack food and red meat consumption, screen time, decreased physical activity, and physical distancing[15,24].

Thus, the risks related to the development of obesity in adolescents during the COVID-19 pandemic were as follows: inactivity in daily living; fragility in psychological care; difficulty in nutritional education; and lack of body and complementary care measures[4,7,10-14,18,22,23,25].

DISCUSSION

Inactivity in daily living combined with the use of Information and Communication Technologies (ICTs) may have contributed to obesity among

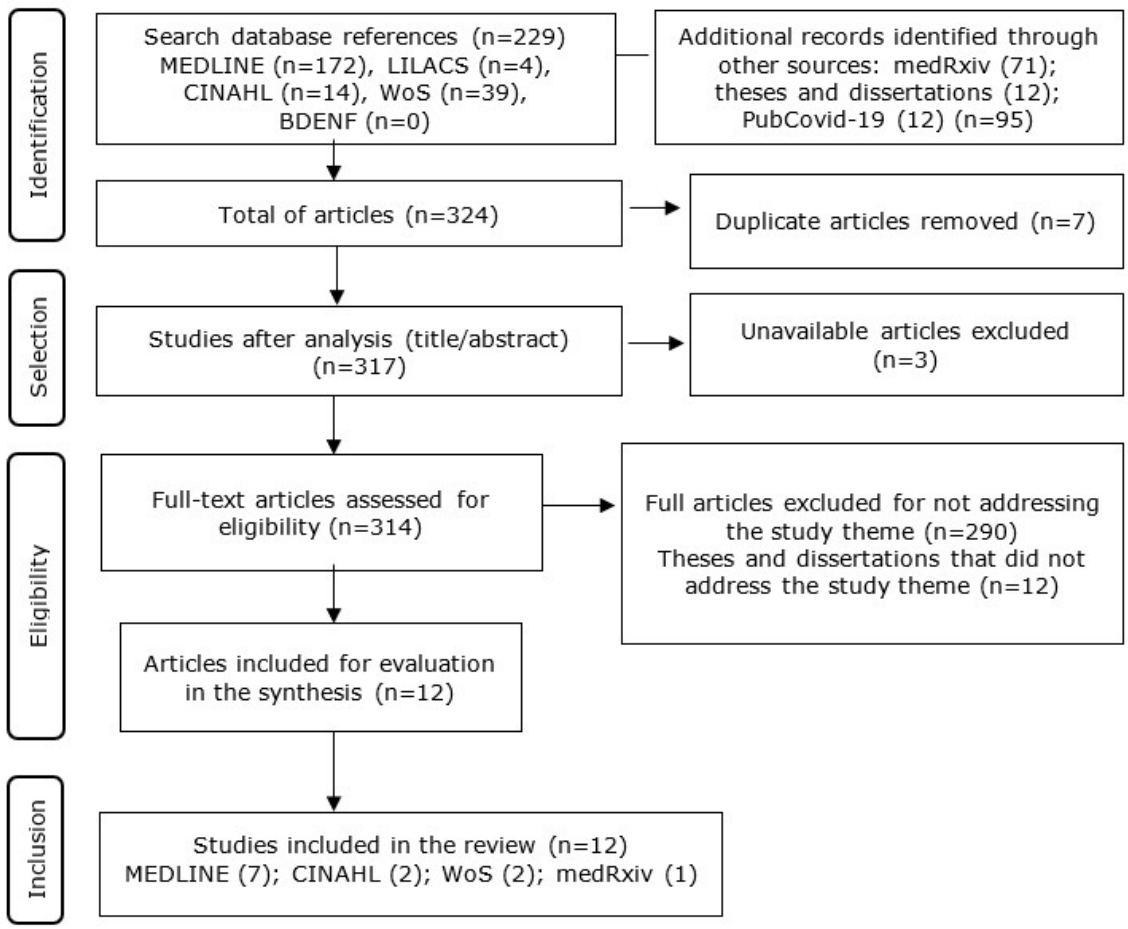

Figure 2 – Flowchart of the study search and selection process, adapted from PRISMA. Crato, CE, Brazil, 2021
Source: PRISMA flowchart adapted from Moher et al., 2009.

https://doi.org/10.17665/1676-4285.20226548

Author (Year) Journal	Country	Nature of the study	Objective	Sample design	Findings that answer the guiding question
Androutsos et al. (2021)[15] *Nutrients*	Greece	Quantitative and descriptive	To report changes in the lifestyle of children and adolescents during the first COVID-19 lockdown and to explore potential associations between the changes in the participants' lifestyle behaviors and body weight.	Cross-sectional and descriptive n=397 adolescents (±18 years old)	Lifestyle changes were associated with weight gain in the adolescents. Considering that the COVID-19 pandemic could lead to more lockdowns, effective eHealth and mHealth strategies and programs for adopting lifestyle behaviors and preventing excessive body weight gain are urgent.
Boukrim et al. (2021)[16] *Annals of Global Health*	Democratic Sahrawi Arab Republic	Quantitative and descriptive	To evaluate the effect of confinement on weight gain and dietary behavior of higher education students during the confinement period.	Cross-sectional and observational 406 adolescents (±20 years old)	The students are engaged in low-intensity activities, probably due to the boredom and stress produced by the COVID-19 confinement. The study showed the association between gender, diet, physical activity and stress.
Calcaterra et al. (2020)[17] *Frontiers in pediatric*	Italy	Qualitative	To report crucial advice for diet and physical activity in children and adolescents with obesity during the COVID-19 pandemic.	Opinion	Diet and healthy behaviors such as physical activity scheduling, limited screen time, and adequate sleep can help children cope with required social restriction rules, contributing to positive emotions, emotional stress responses, weight management and health.
Fernandez-Rio et al. (2020)[18] *Obesity Research & Clinical Practice*	Spain	Quantitative and descriptive	To assess the individuals' weight changes during home confinement.	Cross-sectional, of the before-and-after type n=4,379 individuals (18-89 years old)	The stressful context caused by home confinement exerted an impact on people's weight (both gain and loss), especially in men and younger individuals, expanding the concept of pre-obesity to include weight loss.
Jia et al. (2021)[19] *Int J Obes (Lond)*	China	Quantitative and descriptive	To present the changes in a set of activities of significant clinical and political relevance among young Chinese people before and after the confinement.	Retrospective cohort 10,082 adolescents (±19.8 years old)	In the young individuals, weight status increased across all three schooling levels (high school, undergraduate, and graduate), as well as the sedentary, sleep and screen times. The frequency of physical activities decreased, which may be associated with people's caution in going out of their houses, even living in cities with low risk of transmission, and the sedentary and screen times can be related to the schools and universities that initiated online teaching between March and April.
Kim et al. (2021)[20] *Nature*	South Korea	Quantitative and descriptive	To explore the impacts of a reduction in physical activity caused by the COVID-19 outbreak on pediatric patients diagnosed with obesity.	Observational and retrospective 90 adolescents (±18 years old)	Exacerbated obesity among school-age children and adolescents that negatively affects the increase in glycated hemoglobin with non-alcoholic chronic diseases.

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Author (Year) Journal	Country	Nature of the study	Objective	Sample design	Findings that answer the guiding question
Ng et al. (2020) [21] *BMJ Open Sp Ex Med*	Ireland	Quantitative and descriptive	To examine how blood pressure in adolescents has changed during the school closures and to identify key barriers and enablers to these changes during school closures.	Cross-sectional and descriptive 1,214 adolescents (12-18 years old)	The inactivity rate increased during the pandemic, reducing the mean physical activity among the adolescents. The social media should promote strategies to increase physical activity in adolescents.
Pietrobelli et al. (2020)[22] *Obesity*	Italy	Quantitative and descriptive	To test the hypothesis that, when removed from school activities and confined to their homes during the COVID-19 pandemic, young people with obesity presented unfavorable trends in lifestyle behaviors.	Observational and longitudinal n=41 adolescents] (±13 years old)	The lockdown brought about deleterious effects such as an increase in the obesity rates. This situation diminishes the strategies of a healthy lifestyle.
Reyes-Olavarría et al. (2020)[23] *Int. J. Environ. Res. Public Health*	Chile	Quantitative and descriptive	To determine lifestyle changes, such as dietary habits and physical activity patterns, caused by confinement during the COVID-19 pandemic, and their association with changes in the body.	Cross-sectional n=700 participants (97 adolescents aged±18 years old)	Consumption of water and development of activities can be recommended, as they are protective factors against the increase in body weight and are supportive factors in the adolescent population.
Roy et al. (2021) [24] *MedRxiv*	India	Quantitative and descriptive	To study the effect of the COVID 19 pandemic on the lifestyle of young adults and adolescents.	Descriptive 1,065 adolescents and young individuals (13-25 years old)	The increase in screen time and habits such as mass watching could be countered by encouraging co-curricular activities in adolescents and young adults. The young generation must maintain a fixed sleep schedule, healthy eating habits and some degree of exercise regimen.
Yang et al. (2020)[25] *Clinical Obesity*	China	Quantitative and descriptive	To assess changes in obesity and activity patterns among young people in China during the COVID-19 lockdown.	Retrospective n=10,082 adolescents (±17.5 years old)	Reduction of active activities with energy expenditure of moderate to vigorous intensity both in free time and in house chores. Subsequent increase in physical inactivity, and in sleep and screen time.
Zhu et al. (2021)[26] *Int J Environ Res Saúde Pública*	China	Quantitative and descriptive	To comprehensively analyze the impact of home lifestyle due to the COVID-19 outbreak on Chinese people's diet, exercise and sleep.	Cross-sectional and descriptive 889 individuals (18-70 years old)	Increased food intake and reduced physical activity were the factors that most contributed to weight gain. Normal weight people were more likely to gain weight than overweight or obese people.

Figure 3 – Characterization of the studies included in the scoping review. Crato, CE, Brazil, 2021

Source: Prepared by the authors, 2021.

the adolescents. They were exposed to excessive screen time due to, among other reasons, the online format of the classes, decreased sleep and increased stress[27]. Sleep quality among the adolescents decreased as cell phone exposure increased at night. In this sense, sleeping less than eight to ten hours a night is considered a risk factor for obesity[28].

It is noteworthy that psychological stress contributes to high consumption of food products. Unrestricted consumption of processed food products, consumption of alcoholic beverages and drug use were unhealthy habits that exert a direct impact on the adolescents' health[29].

Thus, during the Nursing consultation, patterns of risk behaviors are identified supporting the development of educational practices necessary for the construction of strategies affecting the adolescents[30].

In relation to the risk of fragility in psychological care, social distancing/isolation were necessary measures to prevent contamination by COVID-19. However, the change in the daily routine may have triggered negative outcomes related to emotional and psychological aspects such as increased binge eating, bulimia and anorexia[30].

According to the United Nations[31], increased levels of anxiety and depression symptoms were spurred by the COVID-19 pandemic. In this context, the Nursing team works in intersectoral planning to propose multisectoral actions that offer care to the individuals and the community[32].

As for the nutritional risk, the studies identified the presence of spices, sugars and fats. According to a study[33], overweight and obese people are more likely to experience changes in their eating habits during the social isolation period. A study conducted during social isolation with 820 Brazilian adolescents aged from 10 to 19 years old showed that binge eating and the reduction in the consumption of vegetables and legumes triggered obesity[34]. On the other hand, nurses follow-up individuals in situations of nutritional imbalance, strategic planning and monitoring[35]. Nutritionists must act as members of these collective actions.

The study in question evidenced lack of physical exercise as a risk factor. A study[16] showed that practicing physical exercise is protective to prevent obesity. However, 30.4% of the adolescents interviewed during the pandemic answered positively to the practice of physical activity, which reduced obesity[36].

Absence of complementary care measures was identified as a predictor of obesity. Complementary care included vaccination and referral of the adolescents to specialized care services, when necessary. In this sense, attention is drawn to the aggravation of risks among girls, brown-skinned, aged up to 19 years old and from rural areas[37].

Immunization is a field of competence of Nursing. In addition to that, it is a prevention strategy that promotes control of pandemics such as COVID-19. With the evolution of the vaccines, the national plan reinforces that the use of Pfizer's immunizer (Biontec) for adolescents, from 12 years old, is indicated; although it does not rule out the use of Coronavac (Sinovac)[38].

In this context, Nursing can help to strengthen health promotion strategies, group screening and harm reduction. Knowledge of the risk factors related to obesity assist in the situational diagnosis and can support the proposal of efficient actions that exert an influence on the adolescents' health.

The classification of obesity can have different parameters depending on the country, which is the limitation of the study. In this way, new studies are encouraged in order to elucidate possible tools that enable the care and comprehensive monitoring of adolescents.

The contributions of this study refer to the identification of risk factors for the development of obesity in adolescents in the face of the COVID-19 pandemic and guide Nursing actions for the prevention of obesity. The adolescents' needs require actions carried out by nurses, which can reduce the complications that reverberate in that population.

CONCLUSION

Physical inactivity, fragility in psychological care, difficulty in nutritional education, and lack of body and complementary care measure were the risk factors related to obesity in adolescents in the face of the COVID-19 pandemic.

In this sense, the results reflect that the risk factors identified are amenable to health interventions. In this context, the role of Nursing is essential in the development of activities aimed at promoting health, preventing diseases and encouraging the adoption of healthy habits through the implementation of care programs and mapping strategic points for the practice of physical exercise, in addition to conducting therapies and nutritional guidance with the multidisciplinary team. Thus,

this study points to the need for protocols aimed at the care of adolescents in situations of vulnerability to obesity and to new research studies on the theme, in order to support the approach and interventions to prevent obesity among adolescents during the COVID-19 pandemic.

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