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Association between physical activity and suicidal attempt in Hispanic female adolescents from United States of America

Asociación entre actividad física e intento de suicidio en adolescentes hispanas de los Estados Unidos de América

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ABSTRACT

Introduction: Moderate physical activity is proven to decrease the risk of suicidal attempt in male adolescents, but in women is not yet established. Objectives: Our objective was to study the association between physical activity intensity and suicidal attempt in Hispanic female adolescents younger than 17 years old from database 2015 Youth Risk Behavioral Surveillance System (YRBSS). **Methods:** Secondary analysis of a YRBSS database. We calculated the Odds Ratio (OR) and 95% confidence interval (CI) through logistic regression. **Results:** A total of 1852 subjects were included for analysis. Four out of 10 students reported moderate physical activity and 15% of them attempted suicide one or more time. Physical activity and suicidal attempt had no significant association (OR:1.06 95% CI:0.69-1.62). There was no significant association between physical activity and suicidal attempt, but suicide attempt is significantly associated with age, alcohol use, active sexual life, and age of beginning of sexual relationship. Non adjusted and adjusted Odds ratio showed higher risk to commit suicide for younger girls, of those who do not use alcohol or no having sexual relationship before 15 years old (OR 0.44 (0.19-1.00), 0.47 (0.33-0.56) 0.40 (0.26-0.63) 0.58 (0.37-0.89, respectively). **Conclusions:** Physical activity was found no to be associated with suicidal attempts. Late adolescence, no consumption of alcohol, not having sexual intercourses and beginning sexual relationships in late adolescence may be protective factors against suicide.

Keywords: Physical Activity; Suicidal Attempt; Adolescence.

RESUMEN

Introducción: Se ha demostrado que la actividad física moderada disminuye el riesgo de intento de suicidio en adolescentes varones, pero aún no se ha establecido en mujeres. **Objetivo:** Nuestro objetivo fue estudiar la asociación entre la intensidad de la actividad física y el intento de suicidio en adolescentes hispanas menores de 17 años de la base de datos 2015 Youth Risk Behavioral Surveillance System (YRBSS). **Método:** Se calculó la Odds Ratio (OR) y el intervalo de confianza (IC) del 95% a través de la regresión logística. **Resultados:** Se incluyeron para el análisis un total de 1852 sujetos. Cuatro de cada 10 estudiantes reportaron actividad física moderada y el 15% de ellos intentó suicidarse una o más veces. La actividad física moderada y el intento de suicidio no tuvieron asociación significativa (OR:1,06 IC 95%:0,69-1,62). No hubo asociación significativa entre la actividad física y el intento de suicidio, pero el intento de suicidio está significativamente asociado con la edad, el consumo de alcohol, la vida sexual activa y la edad de inicio de la relación sexual. Las Odds ratio ajustadas y no ajustadas mostraron mayor riesgo de cometer suicidio en las niñas más jóvenes, de aquellas que no consumen alcohol o no tienen relaciones sexuales antes de los 15 años (OR 0,44 (0,19-1,00), 0,47 (0,33-0,56) 0,40 (0,26-0,63) 0,58 (0,37-0,89). **Conclusiones:** La actividad física no se encontró asociada con intentos suicidas. La adolescencia tardía, no consumo de alcohol, no tener relaciones sexuales e iniciar relaciones sexuales en la adolescencia tardía pueden ser factores protectores contra el suicidio.

Palabras clave: Actividad física; intento de suicidio; Adolescencia.

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INTRODUCTION

Adolescence is one of the most difficult times of human development, as many factors related to health and well-being at this stage impacts long-term results (Blum, Mmari, & Moreau, 2017).

Adolescents who attempt or die by suicide often suffer from feelings of sadness, hopelessness, depression, or other undiagnosed mental health disorders (Bilsen, 2018). Suicide has become a progressive public health problem in many societies; and in this group of age causes many years of life lost, reflects great suffering and has mental health ramifications for families and communities (Lewiecki, 2011).

Among USA 2015 high school students, 18% reported having seriously considered suicide, 15% had a plan and 9% had attempted suicide at least once during the past 12 months. The prevalence of suicidal ideation among adolescence is higher for Hispanic females (26%) compared to other ethnicities or males (11%) (CDC, 2017). Suicide is the second leading cause of death among adolescents ages 10–19 in the United States (CDC, 2018).

Kann et al. reported that in 2017 among adolescents in USA, 7.4% had attempted suicide; the prevalence of having attempted suicide was higher among female (9.3%) than in male (5.1%) students (Kann et al., 2017).

Several studies expose the risk factors for suicide, being physical activity one of them. The prevalence of suicide attempts increased with increasing sedentary leisure-time per day (from 9% at <1 h/day to 16.8% at >8 h/day) (Vancampfort et al., 2019).

Physical activity (PA) and exercise have been shown to be profoundly beneficial to mental health, with robust antidepressive, anxiolytic, and self-efficacy and mood-enhancing effects (Sibold and Berg, 2010;

Dunn et al., 2005). Adolescents that perform physical activity (PA) in a regular way have a positive effect in the prevention and treatment of depression (Schuch et al., 2019). Children and youth aged 5-17 should accumulate at least 60 minutes of moderate - to vigorous-intensity physical activity daily according to the World Health Organization (WHO, 2011).

The mechanisms underlying the beneficial effects of PA on psychological health remain imprecise according to a review performed in 2019 (Biddle, Ciaccioni, Thomas & Vergeer, 2019). According to Southerland et al. (2016) less is known about the relationship between suicidal behaviors and physical activity among adolescents.

The association between physical activity and suicide attempt among girls may be more complex than in boys, where body dissatisfaction may be playing a more prominent role. Female are known to be more concerned about body image than boys. (Bibiloni et al., 2013). Engagement in physical activity may be an effective strategy for prevention of suicide attempts for boys but not for girls. (Felez, et al., 2020). Girls with underlying issues related to body image dissatisfaction and low self-esteem are more likely to have extrinsic exercise goals. Girls may attempt suicide more frequently, but boys are more likely to complete a suicide attempt through use of more lethal methods.

Many studies include only Caucasian adolescents and they findings are often inconclusive, regarding an independent impact of ethnicity on the three adolescent phenomena of suicidality, depression, and alcohol use. Such homogenous studies offer no insight into these risk factors among different cultures, ethnic minority groups, or youths from severely disadvantaged circumstances (Galaif, 2007).

Suicide rates vary by race/ethnicity, age, and other population characteristics, with

the highest rates across the life span occurring among non-Hispanic American Indian/Alaska Native and non-Hispanic White populations (Stone et al., 2017).

Little is known about the association between physical activity and suicidal behavior, and specifically about the association between these two variables in Hispanic female adolescents, which is a subject yet to be analyzed. There is a limited number of articles published on the subject, despite several others in different ethnic groups (Aoibhean, 2015; Brosnahan, 2004).

Youth Risk Behavior Surveillance System (YRBSS) monitors behaviors that contribute to unintentional injuries and violence and physical inactivity. National YRBS data sets and documentation are available for download at YRBSS Data & Documentation. There is no charge for the data nor is permission needed to download or use the data. (<https://www.cdc.gov/healthyyouth/data/yrbs/faq.htm>)

The aim of this work is to explore the possible association between physical activity (moderate or non-moderate) and suicide attempt in Hispanic female adolescents.

METHODS

Study design

This is a secondary analysis of the 2015 Youth Risk Behavioral Surveillance System (YRBSS), developed by the Center of Disease Control and Prevention (CDC). The YRBSS is a national survey conducted in public and private schools among high school students in grades 9th through 12th in the 50 states, District of Columbia, and US territories. We included only Hispanic female adolescents from ages 12 to 17 years.

Variables

The dependent variable used in this study was Suicidal attempt. It was categorized

as “no suicidal attempts” and “one or more suicidal attempts” during the previous 12 months.

Physical activity (PA), was measured as follows: During the past 7 days, on how many days were you physically active for a total of at least 60 min per day? Response options included “0 days”; “1 day”; “2 days”; “3 days”; “4 days”; “5 days”; “6 days”; “7 days”, For research purpose Physical activity, the main independent variable of this study, was categorized as “moderate” or “non-moderate”, considering moderate the physical activity with a minimum duration of 60 minutes per day and with a minimum frequency of 3 days per week.

We included the following variables as potential confounders: adolescence stage, being “early adolescence” with 14 years of age or younger and “late adolescence” with 15 to 17 years of age; alcohol consumption (yes or no); sexual encounters (yes or no); age of beginning sexual encounters, being “early” with 14 years of age or younger and “late” with 15 to 17 years of age.

Statistical analysis

We calculated absolute and relative frequencies for qualitative variables. We included the prevalence of suicidal attempts in a general manner and according to the selected variables (early and late adolescence, physical activity). Association between qualitative variables were analyzed with A Pearson's χ^2 test. To evaluate the relationship between suicidal attempts adjusted by selected risk factors (adolescence stage, age of first sexual encounter, alcohol consumption and type of physical activity) we performed a logistic regression model to find Odds Ratio (OR) and 95% confidence intervals (CI). All variables were included in the regression analysis as categorical variables. Data were analyzed with SPSS Version 24.

Ethics aspects

The YRBS did not collect any personal identifiable information and guaranteed anonymity and confidentiality. Informed consent for humans was hence not required as there was no data obtained at the individual human subject level.

RESULTS

We included 1852 Hispanic female adolescents, younger than 12 years old and up to 17 years old. In **Table 1** we describe the selected variables according to physical activity. We found that 61.7% of the subjects were doing non-moderate physical activity. There were non-significant statistical differences between the two groups ($p > 0.05$). The results showed that the percentages of the studied variables were similar in both physical activity categories.

In **Table 2** we describe the association between our selected variables and suicide attempt. General percentage of suicide attempts was of 15.1%. In the adolescents with non-moderate physical activity, the percentage of suicidal attempts was higher but with non-significant statistical difference. Non-moderate physical activity was also more frequent in late adolescence, in those adolescents with alcohol consumption and sexual encounters. We found that suicide attempt is significantly associated with age, alcohol use, active sexual life, and any age of beginning of active sexual life.

Findings from the multivariable regression analyses were summarized on **Table 3**. We reported non-adjusted and adjusted OR and CI for physical activity and suicide attempt. Non-adjusted data show that the studied variables, except for physical activity, may work as protective factors. Hispanic females in late adolescence have 35% less odds of having a suicide attempt than those in early adolescence (OR 0.65 $p < 0.01$). The young females less than 14 years old that consume alcohol have 68% less odds of a suicide attempt than older girls.

The adolescents with active sexual life have a 60% less likelihood of suicide attempt and those that do not begin their active sexual life during early adolescence are 54% less likely to have a suicide attempt.

The adjusted data shows that the studied variables conserve their protective effect against suicide attempt. The Hispanic females during late adolescence are 56% less likely to have a suicide attempt than those in early adolescence. Subjects that consume alcohol have 60% less probabilities of having an episode of suicide attempt. For an active sexual life, the phenomenon repeats, and for those female adolescents that do not begin an active sexual life during early adolescence are 42% less likely to have a suicide attempt.

Table 1. Baseline characteristics of subjects of the study population (YBRSS 2015).

Characteristics	Physical activity		p value*
	Moderate n=710 (38.3%) N(%)	Non-moderate n=1142 (61.7%) N(%)	
Age			
Early adolescence (14 years or less)	85 (37.6)	141 (62.4)	p = 0.81
Late adolescence (15 years or more)	625 (38.4)	1001 (61.6)	
Alcohol consumption			
Yes	214 (39.3)	331 (60.7)	p = 0.49
No	428 (37.5)	712 (62.5)	

Sexual encounters			
Yes	226 (36.1)	400 (63.9)	p = 0.06
No	449 (40.6)	656 (59.4)	
Age of beginning of sexual encounters			
Early adolescence (14 years or less)	96 (37.4)	161 (62.7)	p = 0.57
Late adolescence (15 years or more)	129 (35.1)	238 (64.9)	

Table 2. Baseline characteristics of subjects of the study population (YBRSS 2015).

Characteristics	Suicide attempts		p value*
	None N=1574 (84.9%) N(%)	One or more N=278 (15.1%) N(%)	
Physical activity			
Non-moderate	969 (61.6)	173 (62.2)	p = 0.83
Moderate	605 (38.4)	105 (37.8)	
Age			
Early adolescence (14 years or less)	180 (11.4)	46 (16.6)	p = 0.01
Late adolescence (15 years or more)	1394 (88.5)	232 (83.4)	
Alcohol consumption			
Yes	411 (28.5)	134 (55.6)	p = 0.00
No	1033 (71.5)	107 (44.4)	
Sexual encounters			
Yes	481 (32.6)	145 (56.4)	p = 0.00
No	993 (67.4)	112 (43.6)	
Age of beginning of sexual encounters			
Early adolescence (14 years or less)	177 (36.9)	80 (55.6)	p = 0.00
Late adolescence (15 years or more)	303 (66.1)	64 (44.4)	

*Chi square test

Table 3. Unadjusted and adjusted association between suicide attempt and all variables. (YBRSS 2015).

Characteristics	No-Adjusted		Adjusted	
	OR (95% CI)	P value	OR (95% CI)	p value*
Physical activity				
Non moderate	Ref	Ref	Ref	Ref
Moderate	0.97 (0.74-1.26)	0.83	1.06 (0.69-1.62)	0.78
Age				
Early adolescence (14 years or less)	Ref	Ref	Ref	Ref
Late adolescence (15 years or more)	0.65 (0.45-0.92)	0.01	0.44 (0.19-1.00)	0.05
Alcohol consumption				
Yes	Ref	Ref	Ref	Ref
No	0.31 (0.24-0.41)	0.00	0.40 (0.26-0.63)	0.00

Sexual activity				
Yes	Ref	Ref	Ref	Ref
No	0.40 (0.31-0.52)	0.00	0.47 (0.33-0.56)	0.00
Beginning of Sexual Activity				
Early adolescence (14 years or less)	Ref	Ref	Ref	Ref
Late adolescence (15 years or more)	0.46 (0.37-0.68)	0.00	0.58 (0.37-0.89)	0.01
*Logistic regression				

DISCUSSION

In the present study, we investigated association between physical activity and suicide attempts in Hispanic adolescents by using data from the YRBSS from USA. We found no significant effects of physical activity (PA) on suicidal behavior after controlling for group of age, alcohol consumption, sex activity and age of beginning of active sexual life. Similar results were found in another analysis of this database (Michael et al., 2020).

Suicide is becoming increasingly common phenomenon in the adolescence stage, the findings of this study revealed that 15.1% of the adolescents had one or more suicide attempts. This figure is higher than what was reported by different authors (Sibold et al., 2015; Michael et al., 2020).

Hispanic children are at an increased risk of obesity and engage in low levels of physical activity according to previous studies (Liu, Probst, Harun, Bennett, & Torres, 2009; Taverno, Rollins, & Francis, 2010).

In the current study, only one third of adolescents reported being physically active. Active adolescents had significantly lower odds of mood disorder (He, Paksarian, & Merikangas, 2018). which can lead to a lower rate of suicidal attempts. Different authors have suggested that higher PA levels are associated with lower suicidal ideation. (Vancampfort et al., 2019) but low PA may be a more important risk for suicidal

thoughts and behaviours among male, than in female, adolescents (Uddin et al., 2020).

Factors like age, beginning of active sexual life during late adolescence (and not before 14 years old) and lack of alcohol ingestion may be protective against suicide attempts in female adolescents.

Female gender has been found to be strongly associated with self-reported suicidal behaviors compared to males (Turecki, 2016). According to a systematic review, physical activity declines by approximately 7% annually during adolescence (Dumith, 2011). Keep in mind that these results are found in both gender and not specifically directed to Hispanic females.

Many studies have reported the physical activity leads to enhanced mood and protects against depression via several biological mechanisms such as anti-inflammatory effects, regulations in the hypothalamic-pituitary adrenal axis, neurotransmitter release regulations among others (Gujral et al., 2017; Lin and Kuo, 2013). Our results have shown that physical activity has no significant association to suicide attempts in this population. According Felez (2020), engagement in physical activity may be an effective strategy for prevention of suicide attempts for boys but not for girls.

These results are contradictory to the ones reported by Brosnahan (2014) who analyzed the 2001 YRBSS and demonstrated that high school students, independent from eth-

nicity, had lesser odds of considering suicide when they participated in moderated-intensity physical activities or in sports

Although authors have made the same association between vigorous physical activity and suicide ideation (Lee, 2013; Rothon, 2010) our results may respond to a trend change over time and ethnicity. Plenty of research done in other countries like Korea, where suicide is the main cause of death in adolescence, demonstrate that physical activity is positively related to suicide, even after adjusting for body image (Lee, 2013).

Adolescents are psychologically more vulnerable to peer pressure, which becomes worrisome when it comes to risk taking activities like smoking, alcohol consumption and early onset sexual intercourse. Some authors have reported that adolescents who practice physical activity regularly and that have a younger age at onset of and active sexual life or have occasional sexual partners experience higher rates of suicidal ideation and attempt (Zhang, 2014; Dubé, 2017).

Although the use of alcohol to facilitate a suicide attempt has rarely been examined, Spokas et al. (2012) reported that approximately one third of attempts are preceded by acute alcohol use. This study identified the use of alcohol as a marker for suicidal attempt in these adolescents. Adolescents drinking alcohol in developmental stages are susceptible to adverse effects of alcohol, including neurocognitive effects (Galaif, 2007).

Individuals who have a dependence on alcohol are at greater risk of having suicide attempts. Young people who admitted to having attempted suicide, were significantly more likely to report alcohol abuse (Zygo, 2016).

For female adolescents, suicide rates are positively correlated with rate of being se-

xually active according to Park (2018). We found that to be sexually active is a risk factor to suicide attempt in these adolescents.

Limitations

The results of this study should be interpreted with caution due to several limitations. First, this is a secondary analysis and the available data we analyzed was not collected to address the particular research question we raised.

On the other hand, assessing physical activity and suicide attempt through self-reporting in adolescents may overestimate true physical activity level and suicidal thoughts. Other factors related to these issues such menarche and past and/or current history of disease that can be barriers for the practice of regular physical activity were not assessed in this study. The cross-sectional nature of the study did not allow to establish a causal relationship between a non-moderate physical activity and suicide attempts. Associations reported need to be confirmed in longitudinal observational studies and also in controlled clinical trials.

CONCLUSION

The strengths of the study include the large sample size and representative information of female adolescents in USA. As a conclusion of this study, we can affirm that there was no evidence that physical activity influence in suicidal attempts in female adolescents. Female adolescents are not benefited from the psychological advantages of physical exercise. Adolescents who consume alcohol and who initiate their sexual encounters with 14 years or less have a greater chance of attempting suicide compared to those who do not consume alcoholic beverages and have late adolescent relationships. More research needs to be performed to study this relationship.

Consent for Publication

Not applicable

Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Authorship

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work."

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