

Sex Differences Associated with Suicide and Years of potential life lost: a Retrospective Study

Diferencias de sexo asociadas al suicidio y años potenciales de vida perdidos: un estudio retrospectivo

Diferenças de sexo associadas ao suicídio e anos potenciais de vida perdidos: um estudo retrospectivo

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Abstract

Objective: To identify the sex differences associated with the potential years of life lost due to suicide in the department of Nariño, from 2005 to 2019. **Methodology:** Descriptive, observational and retrospective study, in which 1686 death certificates by suicide of men and women in the department of Nariño, identified in the National Administrative Department of Statistics, were analyzed. **Results:** From 2005 to 2019, 1,212 suicide cases of men were observed and 474 of women. Women committed suicide at younger ages than men. 50.5% of the men had completed primary school, and 46.0% of the women, secondary school. The highest number of suicide cases of men and women occurred in the urban area (51.2% and 45.1%

respectively). Poisoning was the suicide mechanism most used by women (66.7%), and for men, the highest percentage (41.7) corresponded to hanging. The annual trend of deaths by suicide was higher in men than in women. For men, the suicide rate was above 4.5 suicides per 100,000 inhabitants, while for women, it remained below 3.0. **Conclusions:** There was an increase in the trend of deaths in the period analyzed and the risk of dying by suicide in men was 3.9 times the risk of dying by suicide in women. The study contemplates important aspects to be addressed in suicide prevention.

-----**Keywords:** potential years of life lost, mortality, sex, suicide.

Resumen

Objetivo: Identificar las diferencias de sexo asociadas a los años potenciales de vida perdidos por suicidio en el departamento de Nariño, periodo 2005-2019. **Metodología:** Estudio de tipo descriptivo observacional y retrospectivo, en el que se analizaron 1686 certificados de defunción por suicidio de hombres y mujeres en el departamento de Nariño, identificados en el Departamento Nacional Administrativo de Estadística. **Resultados:** En el periodo 2005-2019, se observaron 1212 suicidios en hombres y 474 en mujeres. Estas se suicidaron a edades más bajas que aquellos. El 50,5 % de los hombres habían cursado básica primaria, y el 46,0 % de las mujeres, básica secundaria. El mayor número de casos de suicidios en hombres y mujeres se presentaron en el área urbana (51,2 % y 45,1 % respectivamente). El envenenamiento fue el

mecanismo de suicidio más utilizado por las mujeres (66,7 %), y para los hombres, el mayor porcentaje (41,7) correspondió al ahorcamiento. La tendencia anual de muertes por suicidio fue mayor en hombres que en mujeres. En aquellos, la tasa de suicidio se situó por encima de 4,5 suicidios por 100 000 habitantes, mientras que, en ellas, se mantuvo por debajo de 3,0. **Conclusiones:** Hubo un aumento en la tendencia de muertes en el periodo de tiempo analizado y el riesgo de morir por suicidio en el hombre fue 3,9 veces el riesgo de morir en una mujer. El estudio contempla importantes aspectos para ser abordados en la prevención del suicidio.

-----**Palabras clave:** años potenciales de vida perdidos, mortalidad, sexo, suicidio.

Resumo

Objetivo: Identificar as diferenças de sexo associadas aos anos potenciais de vida perdidos por suicídio no departamento de Nariño, no período 2005-2019. **Metodologia:** Estudo de tipo descritivo observacional e retrospectivo, em que foram analisados 1686 certificados de óbito por suicídio de homens e mulheres no departamento de Nariño, identificados no Departamento Nacional Administrativo de Estatística. **Resultados:** No período de 2005-2019, observaram-se 1212 suicídios em homens e 474 em mulheres. Elas suicidaram-se em idades menores do que eles. O 50,5% dos homens cursaram o ensino fundamental, e o 46% das mulheres o ensino médio. O maior número de casos de suicídios em homens e mulheres apresentou-se na área urbana (51,2% y 45,1%, respectivamente).

O envenenamento foi o mecanismo de suicídio mais utilizado pelas mulheres (66,7%), e para os homens, a maior percentagem (41,7%) correspondeu ao enforcamento. A tendência anual de mortes por suicídio foi maior em homens do que em mulheres. Neles, a taxa de suicídio esteve por cima de 4,5 suicídios por 100.000 habitantes, enquanto nelas se manteve abaixo de 3,0. **Conclusões:** Houve um aumento na tendência de mortes no período de tempo analisado e o risco de morrer por suicídio no caso dos homens foi 3,9 vezes o risco de morrer de uma mulher. O estudo contempla aspectos importantes a serem abordados na prevenção do suicídio.

-----**Palavras-chave:** anos potenciais de vida perdidos, mortalidade, sexo, suicídio

Introduction

The World Health Organization (WHO) indicates that “suicide is a serious public health problem globally” [1, p. 7]. This phenomenon has evidenced a high social impact, “with broad effects in families and in communities” [2].

Considering the foregoing, it is important place some epidemiological aspects que permit visualizing the problem globally regarding suicide. In this sense, Fazel and Runeson [3] indicate that, at that level, in 2016 there was an estimated 793,000 deaths due to suicide, thus, representing an annual global suicide rate standardized by age of 10.5 per 100,000 inhabitants. Likewise, the Ministry of Health states that suicide “is among the first three causes of death in individuals from 15 to 44 years of age” [4].

In Colombia, “19,977 suicides were reported in the decade 2008-2017; during the first six years, the rates

ranged between 4.2 and 4.5 per 100,000 inhabitants, while during the period 2014-2017 the rates have shown a constant rise from 4.3 to 5.7” [5]. Deaths from self-inflicted lesions went from 2,118 cases in 2010 to 2,927 in 2019; that year, 587 women died due to suicide [6].

In the epidemiological profile of Nariño, carried out for the period from 1995 to 2003, a 2:1 man/woman suicide ratio was found, with a higher frequency of cases in the age group from 18 to 24 years. Intoxication was the most-used mechanism to commit the act, (70%); of these acts, 80% occurred in the homes. During this period, a rising trend was found, going from a rate of 3 for every 100,000 inhabitants in 1995, to 7 for every 100,000 inhabitants in 2003; which contrasted with the diminishing trend nationally in the last five-year period, when rates ranged between 4 and 6 for every 100,000 inhabitants [sic] [7].

In the city of Pasto, the study conducted with individuals < 18 years of age (data analysis of 151 patients) is

highlighted with suicide attempt, hospitalized between 2016 and 2017 [8]. This study indicates a prevalence of 0.8 cases for every thousand admissions; the mean age was 14.7 years and 74% (112) were girls. It was noted that 61.6% (58) of the population with suicide attempt had a dysfunctional family environment, and academic problems and depression occurred with high frequency.

From another perspective, the scientific literature has reported diverse risk factors associated with suicide. Authors, like Fazel and Runeson [3], mention as principal factors genetic, psychological, and personality characteristics. In this same line, the WHO and the Pan-American Health Organization (PAHO) [9] add to this list social factors and factors associated with the health system, among them: difficulties in access to health care, denial upon the need for timely attention, the ease in the disposition and access to suicide mechanisms and broadcast media related with such. Cuesta [10], in turn, states that in the suicide phenomenon other factors intervene, like social, cultural, biological and environmental factors.

In accordance with the foregoing and situated in the context of this work, sex differences as risk factor associated to suicide have been widely studied. Authors, like Lee *et al.*, [11] conducted a study in adolescents, with one of its elements being sex differences in completed suicide. It reported important sociodemographic data, describing that women, at the moment of suicide, had more probabilities of being students, while men had more probabilities of having a job. As reported in that study, hanging was the most-frequent suicide method in women, while firearms were used only by men.

For their part, Cha *et al.*, indicate that “suicide behavior and deliberate self-aggression are conducts more common in women, but completed suicide is more common in men” (cited in [11, p. 251]).

The findings of a systematic review on suicide conduct in adolescents and youth indicate that women had a risk two times greater of suicide attempts than men, while men had a risk three times higher of dying due to suicide than women [12].

Callanan and Davis [13] highlight that men with background of depression disorders had more probabilities of suicide through hanging, while women with depression had less probabilities of dying through this mechanism, compared to women without antecedents of depression.

Recognizing the problem regarding suicide, the Colombian Ministry of Health and Social Protection adopted the National Policy on Mental Health [14] and exposed that suicide behavior is established as a highly relevant phenomenon in public health, given its individual, family, and social implications. In turn, the PAHO proposes that interventions para la prevention of the suicide behavior must address mental health determinants,

among them, sex (cited by the Colombian Ministry of Health and Social Protection [15]).

In response to such, research on suicide are considered pertinent to the extent that their findings contribute to public interventions. In the same sense, Miranda *et al.*, [12] state that studies regarding gender and suicide are an important referent that contribute to improving knowledge and optimizing prevention programs that permit approaching this problematic in pertinent manner.

Studies related with sex differences and suicide bear implications for public health, given that upon comprehending this problematic the need arises to establish suicide prevention actions specific for sex [11]. Likewise, these “serve as initial steps to improve the scientific approach, the knowledge base and, lastly, prevention of suicide thoughts and behaviors” [16]. Thus, this study is a referent for the city of Pasto, with relevant contributions for the actors of public health and the professional and scientific community, who can guide suicide actions, research, and prevention programs more specific by sex.

Bearing in mind the previous considerations and recognizing that sociodemographic factors, such as sex linked to suicide, become quite relevant, from the research question: What are the sex differences associated with suicide in the department of Nariño during the period 2005-2019? This work sought to identify the sex differences associated to years of potential life lost due to suicide in the department of Nariño, during the period 2005-2019.

Methods

The study was conducted under quantitative, observational, descriptive methodology. It used the user and password assigned by the Colombian Ministry of Health and Social Protection (Minsalud) to one of the researchers to gain access to the death cube of the Integrated Social Protection Information System by Minsalud. This cube allows queries, in the form of tabulated data, from the database of death certificates administered by the National Administrative Department of Statistics (DANE).

The research included death certificates with basic cause of death: intentionally self-inflicted injuries, that is, those with codes ranging from X60 to X84, according with the 10th revision of the International Classification of Diseases (residence in the department of Nariño and date of death between 2005 and 2019). This consultation identified 1,688 cases, and exclude two cases that did not have information on age or sex. Data were consulted on 28 February 2021.

The variables included in the analysis were year of occurrence of the death, sex, age, schooling, area of residence, affiliation regime to the general health social security system and mechanism employed for the self-inflicted lesion.

Initially, the annual trend of deaths among men and women was presented using line graphs. In each year, the difference between the deaths of men and women was measured through the case ratio; the sign difference test was used to statistically evaluate the trend of cases and ratio.

Thereafter, sociodemographic variables were compared between men and women; age was summarized through the mean, with 95% confidence interval and standard deviation. Student's *t* test was used to compare statistically the differences. The other variables were summarized into absolute and relative frequencies.

Additionally, the association of the sociodemographic characteristics and sex was evaluated through Pearson's chi-square test. In cases in which > 20% of the cells had an expected frequency < 5, Fisher's exact test was used with simulated *p* value. In all cases, 5% was considered the statistical significance threshold.

The risk of dying due to suicide was calculated in men and women through the calculation of suicide rates adjusted by age; the direct method and the standard world population were used for fit.

Likewise, the population projections by age group and sex arranged by DANE to calculate specific mortality rates due to suicide. This is an intermediate step to fit the rates.

The difference of the risk of dying due to suicide between men and women was measured with the adjusted rate ratio. All results were displayed in line graphs.

The study calculated the years of potential life lost (YPLL) and their distribution according to sex of the deceased, using the method of standard age life expectancy series, to follow the methodology adopted by the Colombian Ministry of Health and Social Protection [17].

The YPLL through suicide were presented in a line graph, and the percentage distribution by sex of the YPLL, in stacked bars.

The statistical processing of information used Microsoft Office Excel®, licensed to Fundación Universitaria San Martín, as a client for querying data in the death cube and for projection of tables and figures. The association tests were carried out in the freely distributed program R version 4.1.2. The Alternative Time Series Analysis (aTSA) package in R was used for the trend test. The calculation of adjusted rates and YPLL was performed in the Epidat 4.2 free distribution package, through demographic module.

The research was approved by the Research Committee at Fundación Universitaria San Martín, at Pasto

(Minutes PYI2020 of 24 June 2020), considered under Resolution 8430 of 1993 [18] as research free of risk.

The researchers had no access to the microdata of the deaths, only to tabulated consultations, which guarantees the confidentiality of the information.

Results

The work analyzed 1,686 deaths through suicide in the department of Nariño; of these, 71.9% were recorded in men ($n = 1,212$) and 28.1% in women ($n = 474$).

Figure 1 compares the annual trend of suicides between men and women during the study period and presents the suicide ratio between the groups studied. It was found that, during the window of observation, men consistently had more deaths through suicide than women; the behavior in men was irregular ($p = 0.5$); however, 2018 and 2019 had the highest numbers of suicides since 2007. In women, the trend of death through suicide since 2007 is statistically decreasing ($p = 0.023$).

The relative difference of the deaths through suicide between men and women remained on the rise during the study period ($p = 0.032$). In this sense, in 2005, 1.7 suicides were registered in men for each suicide in women; for 2019, the ratio increased to 3.9 suicides in men for each woman committing suicide.

The sociodemographic characteristics of the men and women who committed suicide were also compared; the results are shown in Table 1.

It was found that women committed suicide at statistically lower ages than men ($p = 0.00$); in this sense, the committed suicide, on average, at 26 years of age (standard deviation = 13.7 years), and men at 33.9 years of age (standard deviation = 16.3 years).

With respect to the healthcare regime affiliation, 50.2% of the suicide cases in men belonged to a subsidized regime; in women, this was 49.2%. The healthcare regime affiliation and sex of those committing suicide was associated statistically ($p = 0.04$).

The highest percentage of suicides occurred in individuals residing in the urban area; 51.2% for men, and 45.1% for women, respectively, although no statistical association was identified between area of residence and sex of the suicide victims ($p = 0.45$).

Regarding the educational level, 50.5% of the men had studied basic primary, and 46.0% of the women had studied basic secondary. Schooling and sex of the suicide victims showed statistically significant association ($p = 0.045$).

Poisoning was the suicide mechanism mostly used by women (66.7%); in contrast, men resorted to hanging more frequently (41.7%). The differences between the methods used by men and women had statistical significance ($p = 0.00$).

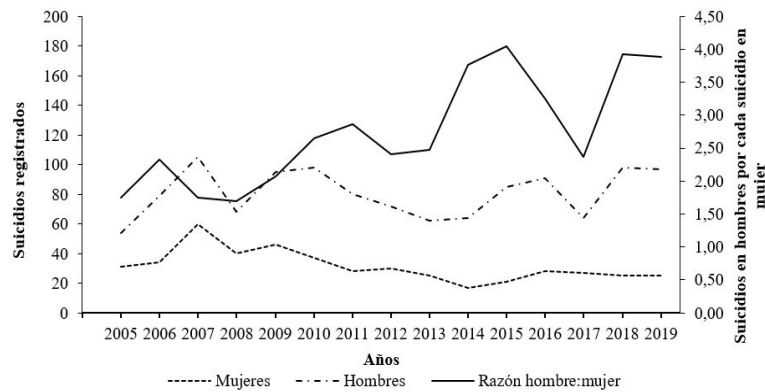


Figure 1. Annual trend of deaths through suicide according to sex and trend of man:woman suicide ratio. Nariño, 2005-2019.

Source: Elaborated by the authors, from data consulted in the death cube of the Colombian Ministry of Health and Social Protection.

Table 1. Sociodemographic data of men and women deceased by suicide

Variable	Category	Women n (%)	Men n (%)	p value – Chi ² test
Total		474 (100)	1212 (100)	
Age	Average (95% CI) - standard deviation	26,0 (24.8-27.2) - 13.7	33.9 (33.0-34.8) - 16.3	0.00*
Healthcare affiliation regime	Contributive	29 (6.1)	111 (9.2)	0.04
	Subsidized	233 (49.2)	608 (50.2)	
	Exception/Special	4 (0.8)	29 (2.4)	
	Without information	208 (43.9)	464 (38.2)	
Area of residence	Urban	214 (45.1)	620 (51.2)	0.125
	Populated center	72 (15.2)	177 (14.6)	
	Dispersed rural	183 (38.6)	406 (33.5)	
	Without information	5 (1.1)	9 (0.7)	
Educational level	Without schooling	14 (4.7)	27 (3.2)	0.045
	Primary	129 (43.0)	432 (50.5)	
	Secondary	138 (46.0)	322 (37.7)	
	Technical or technological	6 (2.0)	18 (2.1)	
	Professional or superior	13 (4.3)	56 (6.5)	
	Without information	174 (36.7)	357 (29.5)	
Mechanism used	Poisoning	316 (66.7)	477 (39.4)	0.00**
	Hanging	117 (24.7)	506 (41.7)	
	Firearm discharge	11 (2.3)	160 (13.2)	
	Cutting object	5 (1.1)	16 (1.3)	
	Drowning-submergence	5 (1.1)	7 (0.6)	
	Throw themselves in front of a vehicle	1 (0.2)	3 (0.2)	
	Exposure to smoke or explosive material	1 (0.2)	3 (0.2)	
	Other means	5 (1.1)	11 (0.9)	

CI: Confidence interval. * Student's t test. ** Fisher's exact test, with simulated *p* value.

Source: Elaborated by the authors, from data consulted in the death cube of the Colombian Ministry of Health and Social Protection.

During the study period, the suicide rate in men was higher than the rate in women. In men, the suicide rate was above 4.5 suicides per every 100,000 inhabitants, while in women it remained below 3.0.

The differences of adjusted suicide rates between men and women have increased; from 2005 to 2009, the risk of dying due to suicide for men was 2.1 times the risk of women; these gaps increased; for the period 2010-2014, the risk of dying due to suicide in men was 3.6 times the risk of women (Figure 2).

The study calculated the YPLL due to suicide in Nariño and their distribution according to the sex of the deceased; the results are shown in Figure 3.

Between 2005 and 2009, Nariño lost 31,106 YPLL due to suicide; 60.8% of these years was contributed by men. In the period 2010-2014, premature mortality from suicide was reduced, reaching 25,075 YPLL; nevertheless, the percentage of years contributed by men increased to 68.8%. Finally, from 2015 to 2019, Nariño lost 26,767 YPLL due to suicide, burden contributed at 75.0% by men.

#1 Discussion

The aim of this study was to determine the sex differences associated to suicide mortality burden in the department of Nariño, during the period 2005-2019. Regarding the implications to public health derived from studies related with sex differences associated with

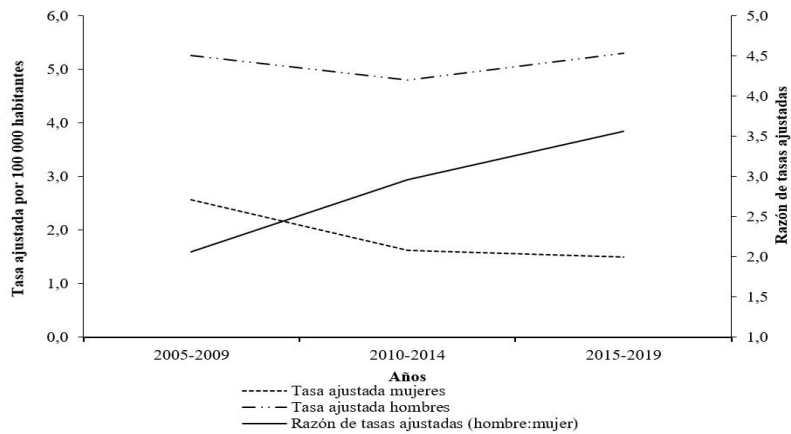


Figure 2. Adjusted suicide rates and adjusted rate ratios in men and women. Nariño, 2005-2019.

Source: Elaborated by the authors, from data consulted in the death cube of the Colombian Ministry of Health and Social Protection.

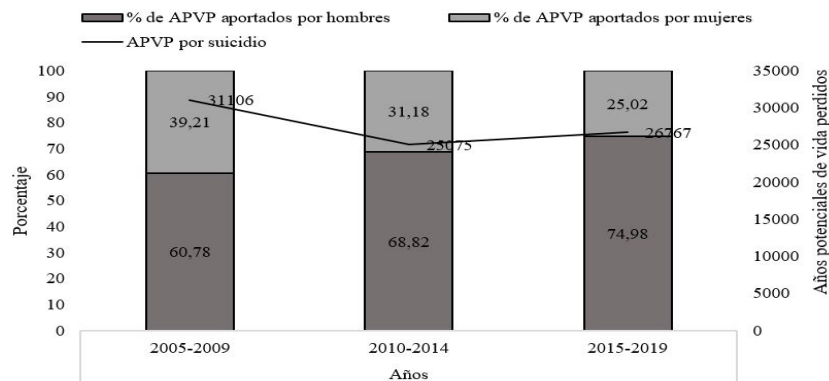


Figure 3. Trend of years of potential life lost due to suicide and their distribution by sex. Nariño, 2005-2019. YPLL: years of potential life lost.

Source: Elaborated by the authors, from data consulted in the death cube of the Colombian Ministry of Health and Social Protection.

suicide, Lee *et al.*, [11] ratify that their findings are an important path to guide specific prevention actions and, similarly, Cha *et al.*, mention that “they offer intervention opportunities” [16].

With respect to the sociodemographic characteristics of men and women who committed suicide, the results of this study evidence that the percentage of suicides is higher in men than in women; men have greater probability of dying through suicide than women [11,16]. In this sense, the need is highlighted to study the groups of risk factors to propose specific prevention proposals [19] according to sex.

In the department of Nariño, during the period 2005-2019, most suicide cases occurred in youth population, both in men and women. In this regard, Fontanella *et al.*, [20] state that suicide in youth has become a public health problem and Ruch *et al.*, [21] indicate the increase in youth suicide rates. The situation described accounts for the need to develop specific prevention strategies for the population, as well as “future research is warranted to examine sex-specific risk factors and protection associated with youth suicide” and how these determinants can inform interventions” [21].

Regarding the level of education, the Institute of Legal Medicine and Forensic Sciences [22] points out that, in deaths due to suicide, low level of training predominates, with little participation of victims with higher education. In line with the aforementioned, the research herein highlights that 50.5% of the men had finished primary and 46.0% of the women had completed secondary; higher education of men and women was very low.

In accordance with the above, the hypothesis of the Institute of Legal Medicine and Forensic Sciences [22] indicates that a high educational level could become a protective factor, to the extent that it facilitates interaction among peers, increases and strengthens the network of friends, equips people with tools to face stressful situations, permits, to a certain extent, to access the job market and, hence, satisfy basic needs and access the social protection system.

With respect to the suicide mechanism, this study shows that poisoning was most used by women; men used hanging. This is a result similar to that found by Benavides, Villota and Villalobos [19], which mentions that among the studies that address completed suicides, the main mechanisms found are suffocation generators, such as hanging, and in toxics, poisoning is found. In this regard, Pantoja *et al.*, mention “that the easy acquisition of toxic substances in the market and at home generates a potential risk for the population [...] for this reason, it is necessary for public health authorities to strictly control this situation” [8].

In relation to suicide rate, in men it was above 4.5 suicides per 100,000 inhabitants, and in women, it was

below 3.0. With respect to suicide rates by sex, prior studies [23,24] point out that the suicide rate in men is higher than the rate in women.

Moreover, the study by Román Moncada and Huaracaya [25] found that suicide rate increased significantly from 2017 (1.44 deaths/100,000 inhabitants) to 2019 (1.95); similarly, in the department of Nariño, in 2017, 2018, and 2019 an important increase was registered in the number of cases, going from 64 to 99. From 2005 to 2009, the risk of dying due to suicide of men was 2.1 times the risk of women. These gaps increased, and for the period 2015-2019, the risk of dying due to suicide of men was 3.6 times the risk of women.

Conclusions

It is concluded that, during the period analyzed (2005-2019), the risk of dying due to suicide shows a marked difference between men and women, registering an unfavorable gap for men and the young population. Said results can be generalized according with the research presented in previous lines.

This study provides important information within the framework of sex differences associated with the suicide mortality burden in the department of Nariño. Nevertheless, limitations exist to consider: it is likely that information bias exists due to the coverage of the certification of the deaths, which is of 22.2% for the department of Nariño, from estimations made by the DANE with data from the 2018 National Housing Census (DANE, 2018) [26].

The analysis addressed identified demographic differences of suicides between men and women; however, and according with the study design, it was not possible to draw statistical inferences of causal order, a relevant aspect to be considered in other research.

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Declaration of conflict of interests

The authors declare no conflict of interest with respect to the research, authorship, and publication of this manuscript.

Declaration of responsibility

The authors declare being responsible for the information shared and for its veracity.

Declaration of authors' contributions

*Viviana Arcos Rodríguez, Andrés Fernando Suarez Molina, Sofía Lisbeth Tarapuez and María Antonella Zambra-*no contributed in the conception of the article design and in the data interpretation. They participated in the design of the research work and in the critical review of its intellectual content. The authors intervened in the approval of the final version for publication and are in the capacity to respond for all the aspects of the manuscript to ensure that issues related with the precision or integrity of any part of the work are adequately investigated and solved.

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