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Suicide and its risk factors – An ecological study

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Abstract:

BACKGROUND: There is tremendous variation in both the prevalence of suicide and the factors that contribute to its occurrence across geographic locations, cultures, and time. Therefore, the present study aims to identify the various socio-demographic risk factors and psychosocial stressors using population data.

MATERIALS AND METHODS: The countries that were included in the study were based on data from the World Health Organization. We considered the top ten suicide countries and the ten lowest suicide nations. We searched five global databases for the most recent socio-demographic data and data on psychosocial stressors during the period of August and September 2022. We analyzed the correlation between suicide rates and various factors, and we considered a *P* value of less than 0.05 to be statistically significant.

RESULTS: The correlation of suicide with sociodemographic factors like age (*P* 0.246), gender (male, *P* 0.357, and female, *P* 0.357), net enrolment rate (*P* 0.725), gender parity index (*P* 0.929), urban population percentage (*P* 0.571), marital status (male, *P* 0.345, and female, *P* 0.752), and literacy rate percentage (*P* 0.199) was not significant. The correlation of suicide with psychosocial stressors like unemployment percentage (*P* 0.552), alcoholism percentage (*P* 0.271), the prevalence of depression (*P* 0.523), the number of psychiatrists (*P* 0.605), the number of mental hospitals ($r = -0.090$, *P* 0.713), and the poverty rate percentage (*P* 0.538) were also not significant.

CONCLUSION: Suicide is a major public health issue, yet global suicide data is scarce. Sociodemographic factors like age, urbanization, and literacy rate were negatively correlated, whereas psychosocial stressors like unemployment, alcohol misuse, and poverty were positively correlated, but none were significantly associated.

Keywords:

Alcoholism, demographic factor, risk factors, risk taking, self-injurious behavior, suicide, suicidal ideation

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Introduction

Suicide is the act of deliberately killing oneself.^[1] It is death caused by intentionally injuring oneself in order to die. A suicide attempt is when someone harms themselves, intending to end their life, but does not die because of their actions.^[2]

Suicide occurs because of many factors, and the prevalence of suicide is not the same in

all places. According to the World Health Organization (WHO), every year, 10 lakh people take their own lives, and there are many more who attempt suicide.^[3] Suicide rates increased by 30% between 2000 and 2018, and as of 2022 statistics, the suicide rates are highest in the Western Pacific region.^[4,5]

The prevalence of suicide varies from country to country because of multiple risk factors. Many suicides happen impulsively in moments of crisis, with a breakdown

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in the ability to deal with life stresses such as financial problems, relationship break-ups, or chronic pain and illness.^[6] In addition, experiencing conflict, disaster, violence, abuse, or loss and a sense of isolation are strongly associated with suicidal behavior.

It is a serious public health problem, but it is preventable with timely, evidence-based, and often low-cost interventions.^[4] Prevention is the key to reducing the number of suicide deaths, and these interventions, combined with psychological and pharmacological treatments and coordinated social and public health initiatives, should continue to improve the management of individuals who are suicidal and decrease suicide-associated morbidity.

But the variables that affect the likelihood of suicide vary significantly among cultures, geographical areas, and historical periods.^[7] The development of suicide risk is complex, involving contributions from biological (including genetics), psychological (such as certain personality traits), clinical (such as comorbid psychiatric illness), and social and environmental factors. A systematic review found that demographic parameters such as such age, gender, socioeconomic status, mental illness, and interpersonal issues influenced the prevalence of suicide.^[7] A meta-analysis by Chang *et al.*^[8] noted that biological risk factors that influence suicidal behaviors are blood-related factors such as glucose, cholesterol, cerebrospinal fluid metabolites: serotonin, dopamine, cytokines, genes like the tryptophan hydroxylase gene, molecule binding, nutrients such as serum cholesterol level, fatty acids, and others. Lee *et al.* studied the psychological suicide risk variables. They are adverse life events that occurred recently or in the past, such as physical and sexual abuse and the loss of significant others; family disagreement or a low degree of communication; and family violence.^[9]

It's difficult to assess a person's suicide risk since there are several risk factors that might affect that risk.^[10] One of the simplest methods to find high-risk groups is to improve risk assessment at the population level. But there is a wide variation in population demographics, and no population comparison is available to signify this relationship. We considered the top ten suicide countries and the ten lowest suicide nations. We searched five global databases for the most recent socio-demographic data and data on psychosocial stressors. Therefore, the present study aims to identify the various socio-demographic risk factors and psychosocial stressors for suicide rates in various countries using population data.

Material and Methods

Literature search

Institutional Review Board of Dhanalakshmi Srinivasan

Medical College and Hospital approved the study before it was conducted (approved number: IECHS/IRCHS/N0: 194B, date approved: 12 July, 2022). We searched systemically in three databases (PubMed, Scopus, and Google Scholar), and we extracted studies on suicidal risk factors. All quantitative, peer-reviewed publications in English that involved inferential analysis on the assessment of risk factors for suicide were used to identify the suicidal risk factors. Based on the works of literature collected, we chose a list of socio-demographic characteristics and psychosocial stressors that had a significant influence on suicide.

Two investigators were involved in determining the inclusion criteria for the variables that were identified based on the literature review. Later, a consensus arrived, and we resolved all discrepancies in choosing the factors. In Figure 1, we list the list of variables that were chosen for studying suicidal risk factors, along with their source database.

Data search

We searched seven global databases (United Nations (UN), WHO, Criminal Investigation Agency, World Bank, United Nations Population Fund, United Nations Development Programme, and World Population Review) for socio-demographic data and data on psychosocial stressors during the period of August and September 2022. Two more investigators extracted information on the publication year, country, and data description for each of the included variables. If the same data were available from more than one source, we chose the variable based on the most recent publication of data.

The countries that were included in the study were based on data from the WHO (2022). We included the countries with the top ten suicide rates and the countries with the lowest ten suicide rates. Along with these, we have included five more nations with great economies in 2022. We represent the countries that were included in Figure 2.

Variable description

We have separately collected the suicidal rates of males and females, along with overall suicidal rates. According to the WHO, the suicide rate is the number of suicides that occur in a year per lakh people.

Socio-demographic characteristics

We included the following socio-demographic data in the study: median age, total male and female population in thousands, sex ratio at birth, net enrolment rate, gender parity index (GPI), urban population percentage, unemployment percentage, male and female marital status from 25 to 29 years, and poverty and literacy rates.

The median age is the age at which we divided the population into two equal parts. There are as many

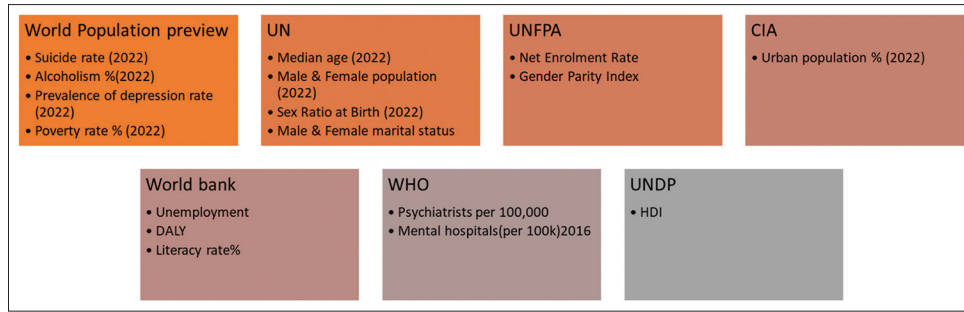


Figure 1: Data variables and their sources

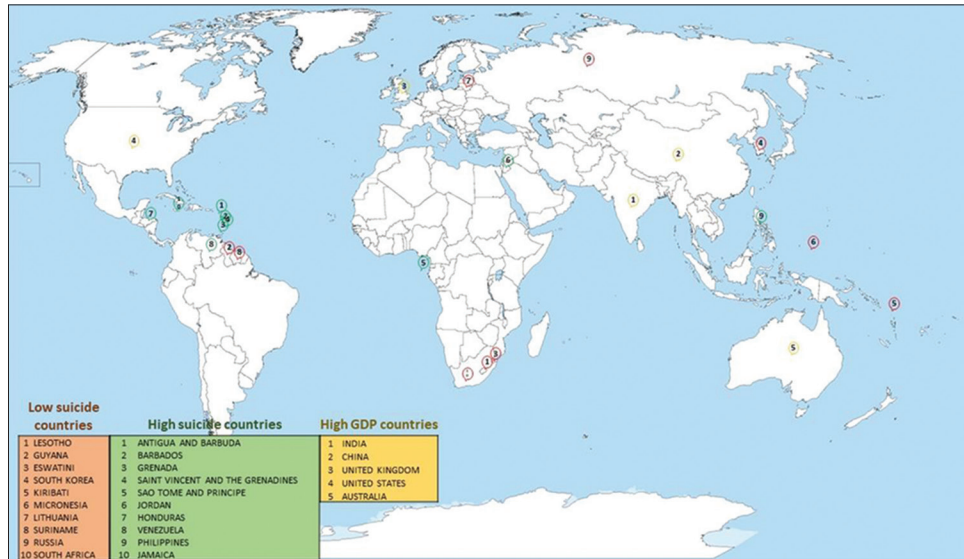


Figure 2: Countries with the highest and lowest suicide rates

people above the median as there are below the median. The sex ratio is the ratio of male to female births. The poverty rate is the number of people (usually expressed as a percentage) in each demographic group whose income falls below the poverty line.

The net enrolment rate is the number of boys and girls of a particular age for a particular level of education (primary) that are enrolled in that level of education, expressed as a percentage of the total population in that age group. We used the GPI for the measurement of socioeconomic status, the GPI. It is the socioeconomic index, usually designed to measure the relative access to education of males and females, and UNESCO released this index.

Psychosocial stressors

We gathered the following data on psychosocial stressors like alcohol misuse, depression rates, and the number of psychiatrists and mental hospitals. Apart from the above factors, we also included one more index in the study, i.e. the Human Development Index (HDI).

We express the prevalence of alcohol misuse and the prevalence of depression in percentages, whereas we express the number of psychiatrists and mental hospitals

per 1,000. The HDI is a summary composite measure of a country’s average achievements in three basic aspects of human development: health, knowledge, and standard of living. It is a measure of a country’s average achievements in three dimensions of human development.

Data analysis

All the data collected was entered into Microsoft Excel (Microsoft Corp., Redmond, WA, USA). We then analyzed the above data to check the pattern of distribution in the IBM SPSS version 21 (IBM Corp., Armonk, NY, USA) version. There was a descriptive analysis done for all the variables. We represented the descriptive variable in frequency and percentage. We represented the continuous variable as the mean and standard deviation, or the median and quartiles. The results of the Spearman’s correlation test show the relationship between many parameters and suicide rates, and we considered a *P* value of less than 0.05 to be statistically significant.

Results

There are 25 countries included in the study of suicide risk factors. We included countries with the top ten and

at least ten suicide rates in studying the factors. We calculated the mean age group of the people from various countries using the median age of each country. The average age is 31.65 ± 8.44 years. Most of the countries have a higher median value (50th percentile) for the female population (1459 thousand) than the median value (50th percentile) for the male population (1403 thousand). The median value (50th percentile) of the net enrolment rate of the countries is 97, and the mean of the GPI is one. In most countries, the average urban population percentage is over 50%. The average married man percentage is 43.17%, and the average married woman percentage is 62.66%. The literacy rate is significantly high in most of the countries, at 93% [Table 1].

We represent the prevalence of psychosocial stressors in Table 2. The median value (50th percentile) of the unemployment rate is 8.84%, and the median value (50th percentile) of the alcohol abuse rate is 6.7. The prevalence of depression is 4.62 ± 0.80 , and the percentage prevalence of poverty is 30.01 ± 19.50 . The median number (50th percentile) of psychiatrists per lakh population is 1.15 per lakh, and the median number (50th percentile) of mental hospitals per lakh population is 0.13 per lakh [Table 2].

Among the various factors studied, the correlation of suicide with sociodemographic factors like age ($r = -0.241, P 0.246$), gender (male, $r = 0.192, P 0.357$, and female, $r = 0.198, P 0.357$), net enrolment rate ($r = 0.076, P 0.725$), GPI ($r = 0.02, P 0.929$), urban population percentage ($r = -0.019, P 0.571$), marital status (male, $r = 0.197, P 0.345$, $r = 0.067, P 0.752$), and literacy rate percentage ($r = -0.285, P 0.199$) was not significant [Table 3 and Figure 3].

The correlation of suicide with psychosocial stressors like unemployment percentage ($r = 0.141, P 0.552$), alcoholism percentage ($r = 0.229, P 0.271$), the prevalence of depression ($r = -0.144, P 0.523$), the number of psychiatrists ($r = 0.135, P 0.605$), the number of mental hospitals ($r = -0.090, P 0.713$), and the poverty rate percentage ($r = 0.0159, P 0.538$) was not significant [Table 4 and Figure 4].

Discussion

This study aimed to determine associations between suicide rates and factors such as sociodemographic factors and psychosocial stressors in 25 countries. We identified countries with the highest and lowest suicide rates and tested the ecological relationship. The analysis found that suicide rates are not significantly associated with any of the demographic or psychosocial stressors at the country level.

Table 1: Sociodemographic characteristics of various countries (n=25)

Demographic Characteristics	Values
Age	31.65±8.44
Male population (per 100 thousand)*	1403 (203, 31293)
Female population (per 100 thousand)*	1459 (207, 32465)
Net Enrolment Rate*	97 (89, 99)
Gender Parity Index	1.00±0.17
Urban population %	57.67±22.96
Male marital status	43.17±21.92
Female marital status	62.66±22.73
Literacy rate	93±7.74

*Represented as Median (Q1, Q3)

Table 2: Psychosocial stressors in various countries (n=25)

Psychosocial stressors	Values
Unemployment	8.84 (5.19, 18.54)
Alcoholism %	6.7 (5.2, 7.2)
Prevalence of depression rates	4.62±0.80
Psychiatrists per lakh population	1.15 (0.6, 3.9)
Mental hospitals per lakh population	0.13 (0.06, 0.36)
Poverty rate%	30.01±19.50

Table 3: Correlation of the suicide rate with sociodemographic characteristics

Demographic Characteristics	Correlation coefficient, r	Confidence Interval	P
Age	-0.241	-0.588 to 0.182	0.246
Male population	0.192	-0.231 to 0.554	0.357
Female population	0.198	-0.225 to 0.558	0.343
Net enrollment rate	0.076	-0.349 to 0.474	0.725
Gender parity Index	0.022	-0.448 to 0.482	0.929
Urban population %	-0.119	-0.500 to 0.301	0.571
Male marital status	0.197	-0.226 to 0.557	0.345
Female marital status	0.067	-0.348 to 0.459	0.752
Literacy rate	-0.285	-0.638 to 0.168	0.199

Table 4: Correlation of the suicide rate with psychosocial stressors

Psychosocial stressors	Correlation coefficient, r	Confidence Interval	P
Unemployment	0.141	-0.333 to 0.559	0.552
Alcoholism%	0.229	-0.194 to 0.580	0.271
Prevalence of depression rates	-0.144	-0.542 to 0.307	0.523
Psychiatrists per lakh population	0.135	-0.383 to 0.588	0.605
Mental hospitals per lakh population	-0.090	-0.533 to 0.391	0.713
Poverty rate%	0.159	-0.361 to 0.604	0.538

In our study, the average population age of the various countries was in the younger age group. Research by Binaya K. Bastia *et al.* discovered a significant relationship between age and the suicide rate, with younger age groups accounting for most suicides. In

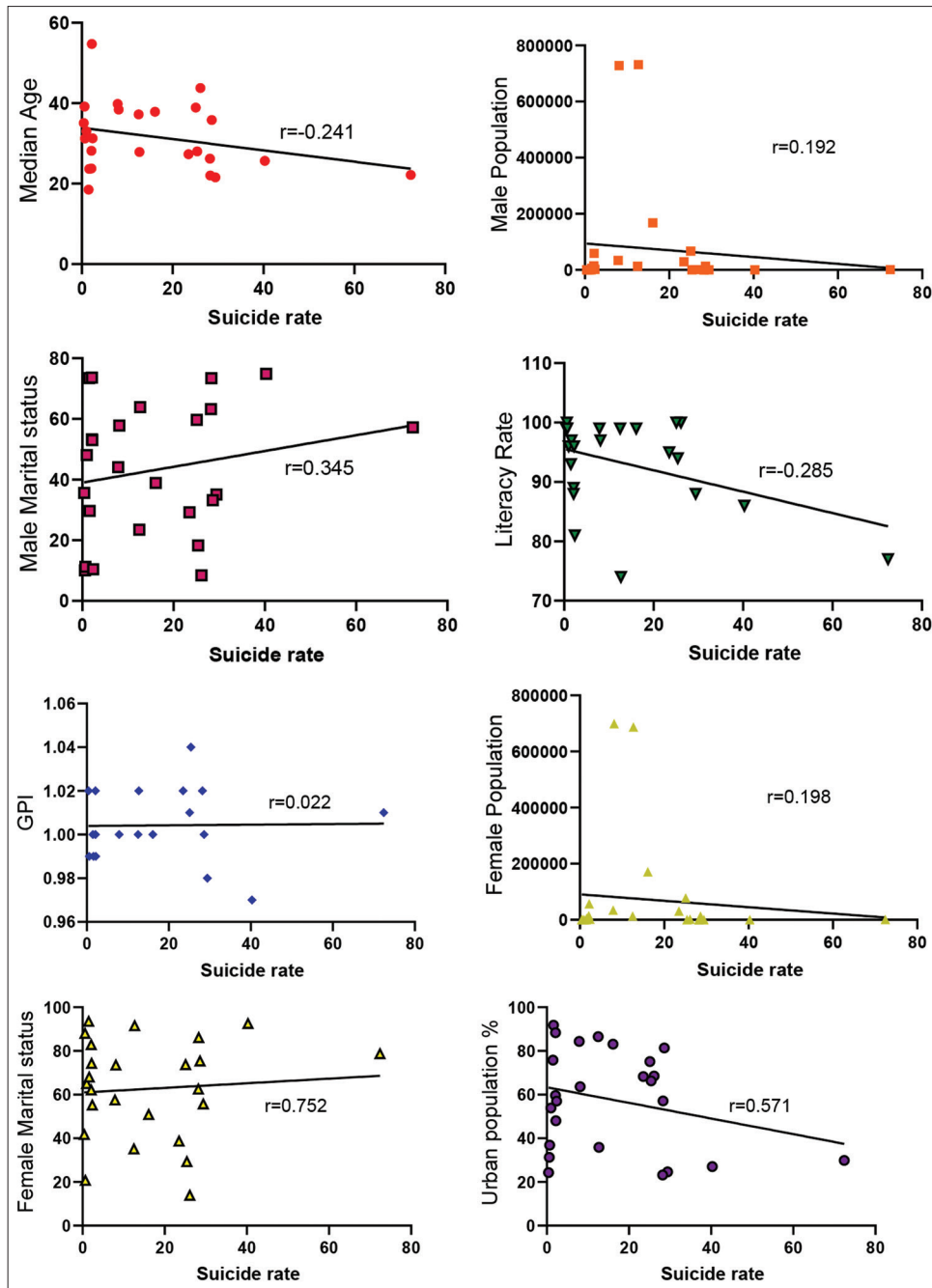


Figure 3: A scatter plot showing the correlation of sociodemographic characteristics with suicide rates

the present study, population age was not significantly associated with suicide rates.^[11]

A systematic review found that there is conflicting data to support gender disparities in suicide rates.^[7] Similarly, in the present study, we did not observe that the gender distribution of the population was significantly associated with suicidal rates. In the present study, we did not correlate the marital status of the population with suicidal rates. In contrast, in a study conducted by Manoranjitham SD *et al.*,^[12] most suicide decedents were married at the time of death.

In a study conducted by Mohanty *et al.*,^[13] individuals who were illiterate or less educated were at significantly higher risk of suicide, and in another study conducted by Chavan *et al.*,^[14] a larger proportion of suicide subjects had completed high school or college. Therefore, evidence for the association between education and suicide is inconsistent. Also, in the current study, the net enrollment rate had no significant relationship with suicide rates.

In research by Gururaj *et al.*, they discovered that it significantly correlated suicide rates with lower

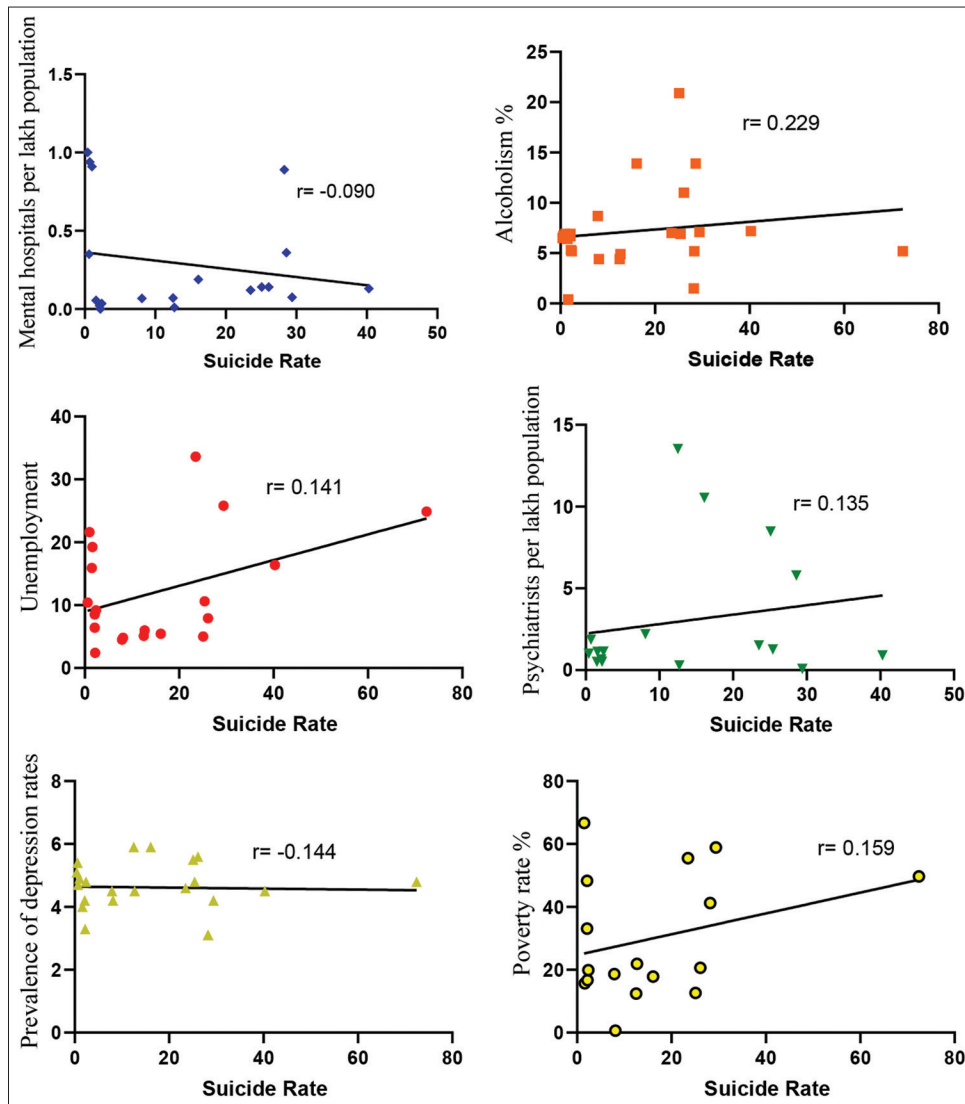


Figure 4: A scatter plot showing the correlation of psychosocial stressors with suicide rates

socioeconomic status.^[15] The GPI and suicide rates did not significantly correlate in the current study, as expected.

In a study conducted by Yasir Arafat *et al.*,^[16] our findings show inverse associations between the HDI, income, and suicide rates. In the present study, HDI was not significantly associated with suicide rates. The reason for this difference may be due to including different countries.

In a study conducted by YV Men *et al.*,^[17] every one percentage point increase in the unemployment rate was associated with a 15% increase in the suicide rate among employed people. But in the present study, the unemployment percentage of the population was not significantly associated with suicide rates. The number of psychiatrists and mental hospitals is significantly associated with suicidal rates, according to a study

conducted by Leonardo Tondo *et al.*^[18] But in the present study, the suicide rates are not associated with psychiatrists or the mental hospital population.

Limitations

We should consider several important limitations while implementing the study's results. First, we extracted data from available global estimates. Even though the well-designed definition facilitates comparison, individual country-wise interpretation is limited. Second, the legal status of suicide has varied between countries, which could be a potential source of bias in suicide reporting. Third, the quality of the suicide reporting system, under-reporting, and misclassification of suicide are potential variables to consider while generalizing the study results. But one of the biggest advantages of the present study is determining the relationship between suicide rates and wider social determinants.

Conclusion

The prevalence of suicide rates is already available for all countries through WHO data. But the risk factors for suicide and suicide prevention have been under-prioritized. This study identified and determined the relationship between suicide rates and broader socio-demographic variables and psychosocial stressors. We didn't observe the suicide rate to be significantly correlated with any of the population's demographic data or data on psychosocial stressors. The identification of demographic risk factors for suicide should be the subject of future meta-analysis or systemic review research to better our understanding of these factors.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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