Editorial

Indian suicide data: What do they mean?

India is a vast country with a population of 1.37 billion. China has 1.42 billion. Together their populations add to nearly 40 per cent of people alive today. If we accept the World Health Organization (WHO) estimates of suicide rates in the 194 Member States (based on data provided by those countries but adjusted, depending on 'usability' of the data), India and China account for 40 per cent or more of the 800,000 annual suicide deaths globally[1]. Southeast Asia has been referred to as the frontline for delivering on the aspirational Sustainable Development Goal of a one-third reduction in the suicide death rate by 2030[2]. With 18 per cent of the world's population living in India, 'addressing suicides in India is imperative to making a global difference in the burden of suicides'[3].

There is good reason to examine Indian suicide data, partly because of the importance of what the findings might mean when compared to data from other countries and cultures. What do the findings show in relation to the causation of suicide, and thus to preventative strategies? Ongoing attention to such data (including differences in rates and patterns between genders, across the age-range, between sub-populations and over time) may be of key importance in understanding suicidal intentions and planning interventions aimed at averting suicide.

The WHO states that about one-third of its Member States provide high-quality suicide data. It will be important to examine the accuracy and reliability of suicide data from India and China in particular since the results from these mega-nations will strongly affect conclusions about global suicide rates and factors that influence them. Improvements in the way China's suicides are identified and recorded have resulted in increased accuracy, though data are still unavailable from more than half the regions of the country[4]. There is evidence of a reduction in suicide rates in China, across the age range, in recent years, prompting questions about why.

Indian studies of suicide

India's National Crime Records Bureau (NCRB) has published yearly reports on suicides since 1967 in the States and Delhi and the Union Territories. Their reports showed an increased suicide rate per 100,000 of the total population from 6.3 in 1978 to 8.9 in 1990. The reported rate then fluctuated, rising between 2006 and 2011, when it reached 11.2[5]. Arya et al[6] calculated age-standardized suicide rates across the years 2001-2013 using NCRB data. Male rates ranged around 14 per 100,000, while female rates decreased from 9 to 7 per 100,000 over the 13 years. The NCRB reported the total number of suicides in India in 2015 as 133,623, the rate being 10.6 per 100,000 with a male to female ratio of 2.2[5].

A number of suicide studies conducted in India between the 1970s and the early 2000s have been listed[7]. Most were from defined regions (*e.g.,* West Bengal) with several relating to villages or rural areas, while others focused on cities and data from tertiary care hospitals. Several case-control studies allowed the analysis of possible causative factors in those areas. Verbal autopsy studies in various rural locations reported high suicide rates. Prasad et al[8] reported an annual suicide rate of 92.1 per 100,000 in a catchment area of Tamil Nadu in 2000-2002, the male to female ratio being 1.5:1. The authors commented that inefficient civil registration systems, incomplete reporting of deaths, variable standards in certifying death and the legal and social consequences of suicide were the major

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obstacles to investigating suicide, but in their area, the obstacles were overcome from 1985 onwards by comprehensive data collection involving community health workers who lived in the villages.

In India, unnatural deaths are reported to police, who then investigate and compile a First Information Report (FIR); this states the apparent cause of death, based on the collection of evidence and (where available) autopsy reports. FIRs are provided to the NCRB. Thus, NCRB data are dependent on what the community reports. There is an incomplete medically certified cause of death system that covers only a small proportion of deaths in India and has variable coverage across the States[3]. It is generally agreed that the NCRB under-reports the frequency of suicide[5].

Despite the under-reporting, the NCRB offers significant insights for the planning of suicide interventions[9]. However, the demonstrable heterogeneity of NCRB data recording demands a need to understand the reporting practices at State level[9]. Around the world, there is a variation between jurisdictions in documented numbers and proportions of persons recorded as having died as a result of 'Event of Undetermined Intent' (EUI; introduced as a diagnostic category in the 8th edition of the International Classification of Diseases), or coded as having died from an ill-defined or unknown cause of death[10]. Variable recording of so-called 'undetermined deaths' between States would affect recording of suicide rates. Clearly, the analysis of factors related to causation needs to include attention to factors considered at a State level, and to factors leading to non-inclusion of completed suicide cases among data provided to the NCRB.

Recent influential national studies

Other than NCRB reports, a nationally representative study by Patel *et al*[11] was the first to estimate India's national suicide rate. This was made possible through the Registrar General's Sample Registration System. Using the 1991 census, India was divided into one million small areas, and in 6671 of these areas, a field-surveyor visited every home where a death had been recorded during 2001-2003. After detailed questioning and involvement of physicians, a cause of death was documented, the cause being suicide in 2741 (2.24%) of all the 122,427 deaths and 2684 (2.8%) of the 95335 deaths of people aged 15 yr or older. The calculated age-standardized suicide rate among those aged 15 yr or more was 22.0 per 100,000 (men 26.3 and women 17.5). The age pattern of male suicides was bimodal, with peaks at the age of 30-44 yr (27.4) and >70 yr (30.2). The graphed age pattern among females was downward-sloping, with a peak at the age of 15-29 yr (24.9 per 100,000).

Commenting on the above study[11], Phillips and Cheng[12] bemoaned the previous lack of high-quality suicide research in low- and middle-income countries, and stated that new information was starting to challenge beliefs about suicide that had been "almost completely based on research from high-income countries that account for only 16 per cent of worldwide suicides"[12].

The Global Burden of Disease (GBD) Study 2016[3] has resulted in similarly astonishing results, but relating to the world as well as India alone. Collaborators in the study[13] described the complex methods and calculations used in the collection and analysis of data. The study included estimates of mortality by location, age and sex between 1990 and 2016 for 195 countries and territories. They used covariates and a combination of multiple independent model frameworks. A major aim of the study has been to ensure that as high a proportion as possible of suicide deaths are identified and included in annual mortality records. The major sources for cause-specific estimation included data on deaths collected by 'vital registrations systems', medical certificates of causes of death, and verbal autopsy studies. When deaths had been assigned by coders to ill-defined or improbable causes of death, those were 'redistributed to the probable true underlying causes of death using various methods'[3]. The researchers postulated that this redistribution together with data standardization led to improved country-level estimates[13].

The GBD Study estimated that there had been 817,000 deaths globally in 2016, comprising 1.49 per cent of total deaths[13]. The study showed that the age-standardized global suicide mortality rate per 100,000 decreased by 32.7 per cent from 16.6 in 1990 to 11.2 in 2016. The decline was greater for women (49%) than men (23.8%). The largest significant decrease occurred in China (64.1%), whereas the decrease in India was 15.2 per cent. However, only 32 per cent of the 195 countries and territories included in the study were reported as showing decreases in the suicide rate. Elsewhere the rate stayed much the same or increased; in some, the rate rose more than 50 per cent. Deaths from suicide in China and India together constituted 44.2 per cent of global suicide deaths in 2016; reductions in their suicide rates were largely responsible for the relatively large global decrease.

Part of the GBD study was related to India[3] and the authors estimated that there were 230,314 suicide deaths in 2016 (contrasting with the 133,623 reported by the NCRB in 2015)[5], the age-standardized rates per 100,000 being 21.2 (men) and 14.7 (women). The male rate was much the same as it had been in 1990, but the reduction in female rate (from 20.0 in 1990) was striking, especially among those aged 10-34 years. In eight Indian States, the suicide rate was above 24 per 100,000, and in six of these States, the female suicide rate exceeded 18 per 100,000; only three countries in the world had rates higher than this level among women. The rate ranged 10-fold between Indian States. The GBD study also showed differences in age patterns of suicide between regions of the world and between genders in those regions[13].

Factors relevant to causation of suicide

A remarkable observation to be made about suicide studies in India is that suicide rates and patterns differ a lot between different States and territories. Possible explanations for these differences may point to factors relevant to the causation of suicide. Referring to 2001-2013 data, Arya et al[6] noted that southern States had the highest and northern the lowest rates for both genders, while rates in central and western States were mainly mid-level. For example, in Tamil Nadu, the male suicide rate in 2013 was 29.9 per 100,000 and female rate 14.6; Maharashtra's corresponding rates were 19.7 and 8.5; Uttar Pradesh's were 2.9 and 2.1 and Bihar's corresponding rates were 1.1 and 0.8. The suicide rates in 2016 reported for different States by the GBD Study[3] were proportionally higher (to a variable extent) than those derived from NCRB data[5,6]. More economically developed States had 3 to 4 times higher rates than less economically developed States, but part of this might be attributed to their better registration of suicide cases[6]. Populations with higher agricultural employment, States with higher levels of male unemployment and States with higher literacy rates had higher risks of suicide. Christians were reported to have a substantially lower suicide rate than Hindus in northeastern States[14], where the former were in the majority, whereas elsewhere in India (with Hindus in the majority), rates were lower in Hindu, and rates in Sikh and Muslim were lower still. Rates were lower among scheduled caste and scheduled tribe populations, and 'other backward classes', especially in regions dominated by these groups; Arya et al[14] suggest that minority stress theory may account for these lower rates.

The NCRB, in their report on suicides in 2015[5], tabled an analysis of identified causes of suicide according to the age group of the decedents. Dowry-related issues (8%), other marriage-related issues (7%), love affairs (6%) and family problems (32%) were thought to explain a majority of cases of suicide of females aged 18-29 yr, while illness other than mental illness was believed to account for the suicides of 25 per cent of both men and women aged 60 yr or more. Married women account for the highest proportions of suicide deaths among women in India. Marriage is less protective against suicide for women than in many other countries ''because of arranged and early marriage, young motherhood, low social status, domestic violence and economic dependence''[3]. Among older persons, social isolation, depression, functional disability and the feeling of being a burden on their family have been cited as reasons for suicidal ideation[3]. Age and gender clearly are factors that should be examined in relation to causation of suicide. To what extent are age and gender related to stress, and how does it differ between States and countries? The relevance of age patterns of suicide in relation to causation of suicide is considered below.

Epidemiological studies of suicide tend not to use diagnostic instruments that can evaluate stress-related conditions. Results from a psychological autopsy study in rural south India have supported a view that the majority of people in India who kill themselves do not have a severe mental disorder[15]. Out of 100 suicide decedents in this case-controlled study (mean age 42 yr), 37 per cent had a DSM (Diagnostic and Statistical Manual of Mental Disorders)-III-R psychiatric diagnosis: two each had schizophrenia, dysthymia or major depression, while 17 had adjustment disorders and 16 had alcohol dependence.

Age patterns of suicide in India and other nations

Gender ratios of suicide rates in Asian and Western countries have differed strikingly for decades. The WHO report[16] shows the overall male to female ratio in South, East and Southeast Asia to be 1.5:1, and in Europe to be 4.0:1. The ratio in six English-speaking Western countries [the United States (US), Canada, Australia, New Zealand (NZ), the United Kingdom (UK) and Ireland] in 2017 ranged from 4 to 3.1:1, while in India it was 1.34:1[3].

Studies from Western countries have shown extraordinary differences in age patterns of suicide

between nations, between genders and over time[17,18]. Relatively little has been written about ways in which India's age patterns of suicide have differed from those of other nations or over time. The GBD study[13] has provided graphical representations of differences between age patterns of suicide rates of males and females (separately) in various regions of the world, showing rates in 2016 across five-year age groups from 10-14 to 90-94 years. Patterns were largely similar between male and female except in South Asia with its clearly bimodal female graphs with equal-sized peaks of nearly 30 per 100,000 at the age of 20-24 yr and in very late life and a much lower rate in mid-life. Males in South Asia showed a peak at just under 30 per 100,000 at the age of 20-29 yr, somewhat lower rates across middle age and a steep rise to over 75 per 100,000 in very late life. High income and European countries showed bimodal patterns (male and female) with peaks in middle age and larger peaks in very late life. East and Southeast Asia showed upward-sloping graphs (as described by Girard[19]) with steeper slopes in old age to peaks (male and female) in very late life.

The analysis of GBD data[3] showed the male and female age patterns for India in 1990 and 2016. The male age-specific suicide death rate in 1990 at the age of 20-29 yr was about 32 per 100,000, and in 2016 at the age of 25-29 yr it was almost the same in both males and females. From age 30 to 74 yr, suicide rates in both years were almost identical at about 30 per 100,000, but incrementally higher rates were recorded over the age range from 75-79 to >95 yr, with the graph half as steep in 1990 as in 2016. The rates at the age of 90 yr or more in 1990 and 2016 were, respectively, about 50 and 80 per 100,000[3]. The female graphs for the same years were strikingly different[3]. In 1990 and 2016, the female suicide rate peaked at the age of 20-24 yr; about 50 in 1990 and 32 in 2016 per 100,000. Suicide rates were then lower across successive age groups, 2016 rates being lower than 1990 rates until age 65-69 yr when rates in both years were about 15 per 100,000. From age 70-74 to >95 yr, the suicide rates were incrementally higher, the 1990 graph rising much less steeply than the 2016 graph. The rates at age 90 or more were, respectively, about 20 and 40 per 100,000[3].

Data from Patel *et al*'s[11] study regarding male and female suicide death rates per 100,000 in larger age groups (15-29, 30-44, 45-59, 60-69 and >70 yr) in 2001-2003 were consistent with the 1990-2016

GBD findings, apart from those for people aged over 70 yr, for whom they reported rates of 30.2 (male) and 9.1 (female) per 100,000. The authors did not reveal the age breakdown of the suicide decedents in this oldest category (*e.g.,* the proportion of the 71 men and 27 women who were aged >75 yr).

The male peak at the age of 20-24 yr in 1990 was similar to a peak seen in graphs of Australian, the US, NZ and British male suicide rates in the 1990s[17,18], but the female peak in India in early adulthood in 2016 was not seen in graphs of the English-speaking Western countries around 2016. A small peak was seen in a graph of the female suicide rate in rural China in the 1990s[20]. Graphs of both male and female rates in East Asia were primarily distinguishable as upward-sloping across the age range, unlike the bimodal graphs of the English-speaking Western countries.

A striking difference in age patterns between India and various Eastern and Western countries was the substantial increase in the suicide rate of elderly males and females in India between 1990 and 2016, whereas late-life suicide rates fell substantially in China, Japan, the US, the UK, Australia and NZ over that period. Ireland's suicide rates in 2012-2014 peaked at the age of 50-54 yr, with a steeply declining graph of male rates from age 65-69 yr to nearly zero at age 80-84 yr (online data; *https://www.cso.ie/en/*). In contrast to their reduced suicide rates of males aged 65-84 yr, rates at age 85+ yr remained high in Australia and NZ. The suicide rate of males and females in Korea has risen dramatically since the 1990s, this being attributed to cultural and financial changes within Korea and to increased use of charcoal-burning as a method of suicide[21]. There was a corresponding dramatic decrease in suicide rates in Sri Lanka with an associated change in age pattern (male now upward-sloping, female steadily downward) between 1995 and 2012[22], changes being attributed to the introduction of regulations regarding the availability of pesticides. Reasons for the rise in late-life suicide in India are debatable and need consideration by researchers able to obtain relevant data, with special attention to differences between States.

Conclusions

Armstrong and Vijayakumar[2] referred to the GBD suicide rate figures as sobering and called for the development of a national suicide prevention plan, but with tailored State and community-level action plans. They said, "there is an imperative to obtain better

suicide mortality data and to give close consideration to trends by sex and age". They highlighted GBD study findings indicating "that youth and older age are key risk periods for women, whereas young adulthood, middle age and older age are key risk periods for men". They emphasized the importance of continuous improvement of suicide research so that policymakers can develop a greater understanding of the issues. They called for multisectoral collaboration and an equal acknowledgement of the socio-economic and cultural determinants of suicide and suicide prevention in India.

There is good news and bad news! The good is that the suicide rate in India appears to have fallen, though to limit concerns about 'hidden' suicides, it is advisable that countries publish rates of death from EUIs and undetermined cause along with their suicide rates. The bad news is that in some parts of India and among particular groups within the population, suicide rates are high or increasing. The fact that the suicide rate of very old persons has doubled since the 1990s needs special attention, with questions about why it is so. There has been little research about age patterns of suicide in India, yet an examination of factors associated with male and female suicide rates (separately) in five-year age groups, including those aged >75 yr, can point to factors that could be causative or preventative. Comparison with comparable data from other nations and cultures may open up new avenues for exploration, taking note of situations that enhance positivity. India's culture is unique and the future looks bright. The challenge is to optimize positivity.

Conflicts of Interest: None.

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