

Factors Responsible for Suicide and Suicidal Ideation in Hungary – A Scoping Review

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Abstract

Suicide represents a major global public health challenge, with the World Health Organisation estimating over 700,000 deaths annually worldwide. Despite being preventable, suicide rates remain alarmingly high in certain regions. Hungary has historically recorded one of the highest suicide mortality rates globally for several decades, making it a critical case study for understanding suicide risk factors. This review examines both suicide and suicidal ideation (defined as thoughts about taking one's own life, ranging from passing considerations to detailed plans) to provide a comprehensive understanding of the factors influencing suicidal behaviour in Hungary.

A scoping review was conducted following the Joanna Briggs Institute (JBI) guidelines to identify English or Hungarian-language articles published from 2000 onwards focusing on the factors responsible for suicide and suicidal ideation in Hungary. Five online databases were searched to identify eligible articles. The articles were analysed for key themes and findings.

In total, out of 1,520 articles initially identified, 29 eligible articles were selected and included in this review.

Three main themes emerged from the articles: environmental context, socioeconomic and demographic factors, individual factors, and mental health. Main risk factors for women include being retired or economically inactive, widowed, divorced, or with a history of depression. Main risk factors among men are unemployment, living alone, never having been married, and addiction. Female gender, higher educational attainment, younger age, and marriage are significantly associated with lowered suicide risk. There is a significant association between seasonality and suicide rates, with a peak in late June-early July.

This review mapped the existing literature on the factors responsible for suicide and suicidal ideation in Hungary. This review highlighted the need for further research investigating the relationship between specific factors and suicide in the country. There are no available full-text studies that focus on suicide among groups of minorities, access to healthcare, and there is a lack of longitudinal studies.

Keywords: Suicide | Suicidal ideation | Scoping review | Hungary

Introduction

Although suicides are preventable, the World Health Organisation (WHO) estimates that over 700,000 individuals across the globe take their own lives every year. This staggering number highlights the immense challenge that suicide poses to global public health – sadly, it often fails to get the priority it deserves (World Health, 2019). The Hungarian suicide mortality rate has historically been among the highest worldwide for decades (Rihmer et al., 2013, Lester, 1995). During the period from 1960 to 2000, Hungary consistently had the highest suicide rate in the world in most years. The reason behind this exceptionally high suicide mortality in Hungary remains not fully understood. One possible explanation is that Hungarian medical

examiners may classify deaths as suicides that would otherwise be related to other causes. However, it is noteworthy that Hungarian immigrants in the United States have the highest suicide rate among all immigrant groups (Lester, 1995, Rihmer et al., 2013).

Suicide was Hungary's leading external cause of death during 1995–2017, with more than an average of 2500 deaths annually (The World Bank, 2023). Between 2000 and 2018, the suicide rate decreased in most EU countries (including Hungary), but the Hungarian rate remains alarmingly high (Öngyilkosság – Fenntartható fejlődés indikátorai) and has not improved since 2006 (Rihmer et al., 2013, Lantos et al., 2021).

In 2020, there were 47,252 deaths due to intentional self-harm in the European Union, corresponding to an average of 10.2 deaths per 100,000 population. Among the EU countries, Hungary registered the second-highest rate of suicide, with 17.1 deaths per 100,000 people. Only Lithuania had a higher suicide rate in the same year (21.3 per 100,000 people) (The World Bank, 2023). When looking at regional data, the South Great Plain region in Hungary recorded the highest standardised death rate for suicide in the European Union, at 23.9 deaths per 100,000 population, well above the EU average (10.24) (eurostat, 2023).

In 2020, there were 28 deaths by suicide per 100,000 male inhabitants and 8 per 100,000 female inhabitants in Hungary. The suicide rate for men was almost four times that for women, and the 55–64-year-old and 65-year-old and older age groups were the most at risk for suicide in both males and females (Öngyilkosság – Fenntartható fejlődés indikátorai).

Although suicide is a complex, multicausal phenomenon, with medical-psychiatric, psychosocial, cultural and demographic components (Tímea et al., 2012), globally, research consistently shows that approximately 90% of individuals who commit suicide have one or more major psychiatric disorders at the time of their death (Hawton and van Heeringen, 2009). The most common of these are major depressive episodes, alcohol/drug addiction, and schizophrenia. On the other hand, it is also true that most psychiatric patients will never commit suicide (Hawton and van Heeringen, 2009, Tímea et al., 2012), which points to the importance of investigating the role of further factors.

Furthermore, due to Hungary's persistent struggle with suicide, there may be certain distinctive characteristics that account for the high suicide rate in this country. A scoping review was deemed to be a suitable study design to identify specific factors responsible for suicide risk and to understand the extent and nature of the evidence related to Hungary (Munn et al., 2018). A preliminary search of Embase, PubMed and Scopus online databases was conducted and no recent systematic reviews or scoping reviews on the topic were identified.

This review aimed to provide a comprehensive overview and synthesis of the available evidence on factors responsible for suicide and suicidal ideation in Hungary, using a scoping review methodology (Munn et al., 2018). The specific objectives of this review are (i) to identify the patterns of suicide and suicidal ideation in Hungary, (ii) to explore the background characteristics of people with suicidal ideation and those who commit suicide in Hungary, and (iii) to determine the major factors that influence people to commit suicide or have suicidal ideation, in Hungary.

Methods

A scoping review of articles was conducted of peer-reviewed publications focusing on the factors responsible for suicide and suicidal ideation among people living in Hungary. We used the guidelines from the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis to map

the current literature. These guidelines, developed by the JBI, provide a comprehensive framework for conducting evidence synthesis and ensuring the quality of the scoping reviews (Peters et al., 2020). According to the JBI methodological guidance, in most cases, the goal of a scoping review is not to synthesise the results or outcomes from the included articles. This scoping review is particularly relevant in the contemporary context of global mental health priorities and the growing recognition of suicide as a preventable cause of death. By mapping the existing literature on suicide factors in Hungary, this review contributes to the broader understanding of mental health challenges in regions with historically high suicide rates and can inform targeted prevention strategies. As such, the analysis of the extracted data does not involve anything more than a primary descriptive analysis (e.g., populations, location of studies, or frequency counts of concepts) (Peters et al., 2020). In line with this guidance, the extracted data were analysed using thematic analysis to map the available literature.

The scope of this review limits a comprehensive discussion of the terminology, but we define some key terms. The WHO's International Classification of Diseases for Mortality and Morbidity Statistics defines suicide as intentional self-harm with intent to cause one's death and suicidal ideation as ideas or thoughts about the possibility of ending one's life, ranging from believing that one would be better off dead to the formulation of acting on these plans (World Health Organisation, 2025). The Centre for Disease Control and Prevention (CDC) similarly describes a *suicide attempt*: a self-destructive act carried out with some degree of intent to end one's life and *suicidal ideation*: a broad term used to define a variety of thoughts, wishes, and preoccupations with suicide (Klonsky et al., 2016).

Search Strategy

Embase, PubMed, Scopus, Web of Science and CINAHL Complete were the databases used to identify published articles. Table 1 presents the search terms used. Boolean operators 'AND' and 'OR' were used, as shown in Table 1, to ensure all relevant articles are found discussing the factors responsible for suicide and suicidal ideation in Hungary.

Table 1. Search terms and Boolean operators for the literature search.

Suicide		Factors		Hungary
Suicide		"Risk factor**"		Hungary
OR		OR		OR
"Suicidal tendency**"		factor*		Hungarian*
OR		OR		
"Suicidal ideation"	AND	Influence	AND	
OR		OR		
"Suicidal behavior**"		correlate*		
OR		OR		
"Suicide attempt"		precursor*		
OR				
"Attempted suicide"				

Inclusion and Exclusion Criteria

Eligibility criteria were determined according to the Population, Concept and Context (PCC) framework. The population referred to those with suicidal ideation or who committed suicide; the concept included the factors responsible for suicide and suicidal ideation in the context of Hungary. Articles published from the 1st of January 2000 onwards, focusing on factors responsible for suicide and suicidal ideation in Hungary, were included. This timescale was selected recognising the significant socio-political and economic transformations Hungary experienced throughout the 1990s following the fall of communism. By starting from 2000, this review captures the factors influencing suicide within the context of Hungary's post-transition period, offering insights into more contemporary patterns while maintaining a reasonable timeframe for analysis. This timescale was selected to provide an adequate overview of the patterns and factors behind suicide in Hungary. Studies were included if they researched factors responsible for suicide or suicidal ideation in Hungary. Quantitative, qualitative and mixed-method studies were eligible for inclusion. In addition to articles written in English, articles published in Hungarian were included. Studies published in Hungarian were reviewed by a co-author of Hungarian origin.

Articles were excluded if they did not provide specific data on suicide risk factors, suicide rates, or factors associated with suicidal ideation in Hungary or were published before 2000. Grey literature represents a significant source of information that could have provided valuable insights, particularly governmental reports, policy documents, and unpublished research on suicide prevention efforts in Hungary. However, as grey literature can differ in format and length, reviewing it and identifying relevant information within it would require significant time and resources, which were beyond the scope of this review; thus, these were excluded. This is acknowledged as a substantial limitation that should be addressed in future research on this critical topic.

Table 2. Eligibility criteria for the publications to be included in this scoping review

	Inclusion criteria	Exclusion criteria
Studies:	Original studies in English or Hungarian	Articles published in languages other than English or Hungarian
Design:	Qualitative, quantitative, and mixed-method studies	Articles that are not original studies (e.g. publications in the form of editorials, reviews or opinion articles)
Context:	Articles focusing on the Hungarian population	Articles that do not focus on the Hungarian population
Population/Concept:	Articles focusing on factors responsible for suicide or suicidal ideation	Articles that are not on suicide or suicidal tendencies
Published:	Articles published from 2000 onward	Articles published before 2000

Selected studies

In total, 1520 articles were found through the database search. Of these studies, 552 related articles were identified in Embase, 365 in PubMed, 299 in Web of Science, 257 in Scopus and 47 in CINAHL Complete. Search results were exported to Zotero, a referencing management software. Zotero was used to minimise duplication bias and detect potential duplicates. 675 duplicate articles were removed before transferring the files into Rayyan – a web-based, intelligent research tool – for screening the titles and abstracts and for full-text review (Ouzzani et al., 2016).

162 articles published before the 1st of January 2000, and 17 articles written in languages other than English or Hungarian were removed before other inclusion and exclusion criteria were implemented. For screening the remaining 666 articles, Rayyan was used. Following the initial screening, 210 articles were selected to assess further eligibility and were read in full.

Search results

Of the 210 records screened for eligibility, 29 articles advanced to full-text review. No additional articles were identified via references or hand searches; thus, these 29 articles were included in the review. The PRISMA diagram is depicted in Figure 3 (Tricco et al., 2018).

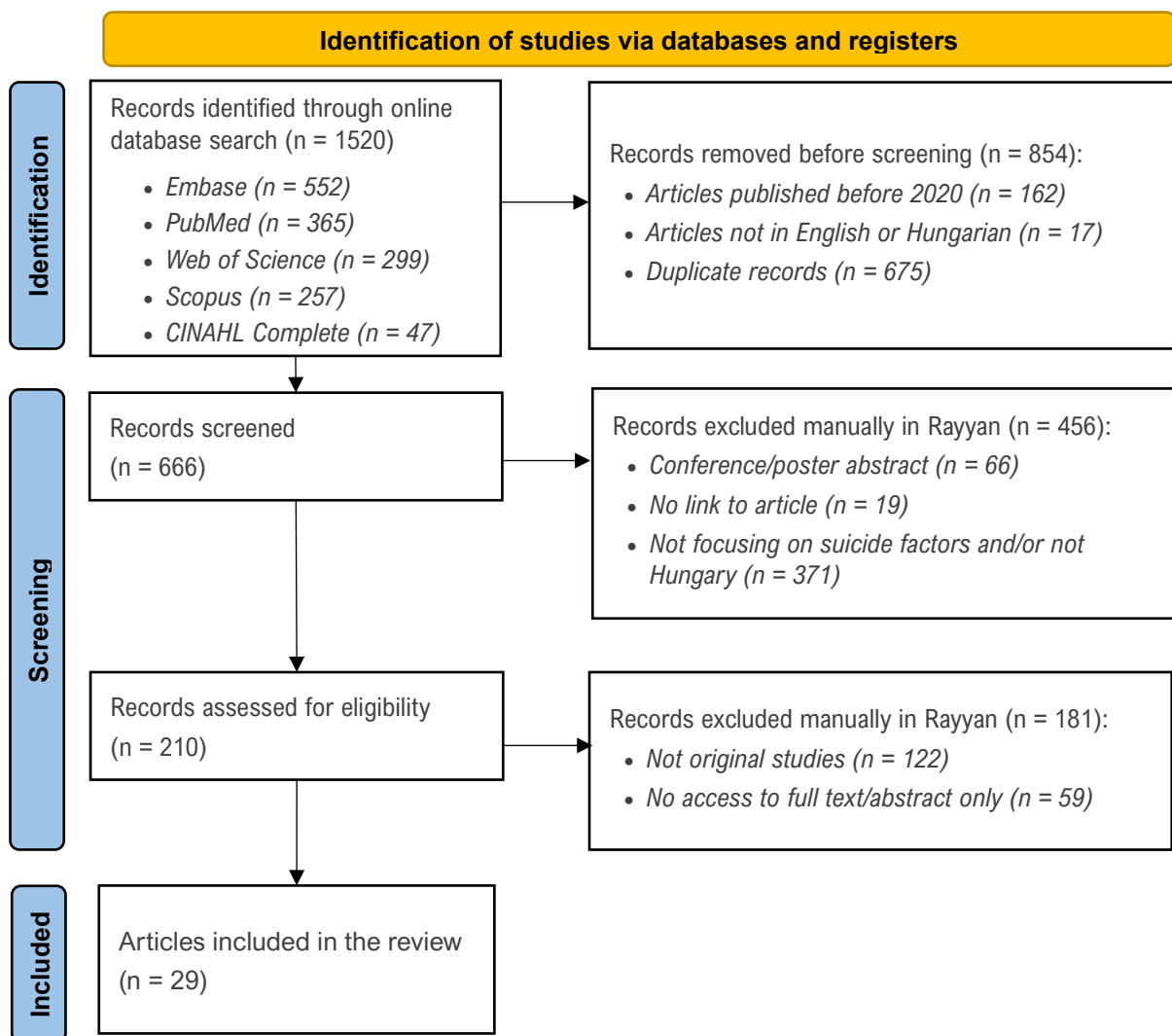


Figure 1. PRISMA diagram – flow chart of articles identified, screened, and included.

Data Extraction and Analysis

Data from the articles was entered into an extraction form. The form included details on authors, year of publication, location, setting, population, period of data collection, method, data sources, factors investigated, key findings and main limitations. The extracted data was then analysed using a thematic analysis. The key characteristics of the included articles are summarised in Appendix 1.

Study characteristics

Of the 29 articles, 13 investigated environmental factors, such as seasonality, sunshine hours, COVID-19, and contaminants in drinking water. Fifteen articles investigated the relationship between individual factors and suicide and suicidal ideation in Hungary; these include mental health issues, depression, Attention-deficit/hyperactivity disorder (ADHD), substance use, irritable bowel syndrome (IBS), and other physical health characteristics. In 9 articles, the demographic and socio-cultural factors were investigated, such as age, gender, marital status, educational attainment, and political and religious integration. Three main themes emerged from the articles: (i) environmental context, (ii) socioeconomic and demographic factors, (iii) individual factors and mental health. The results are organised and presented starting from the broader context, moving towards the individual factors.

The study designs used in the 29 selected publications were time-series analysis (n=15), cross-sectional studies (n=12) and retrospective observational studies (n=2). The most common data sources used were national statistical and mortality databases, interviews and questionnaires, and autopsy and police records. Ten studies used data from Budapest, the capital of Hungary, or other major cities, and 19 used information from national databases or nationwide surveys. There was only one article that focused on territorial differences.

Environmental factors

Seasonality and weather conditions

Eight articles investigated the relationship between seasonality and suicide (Kmetty et al., 2018, Lantos et al., 2021, Tőro et al., 2009, Bozsonyi et al., 2017, Lantos et al., 2019, Bozsonyi et al., 2020, Zonda et al., 2008, Seregi et al., 2017). The numerical distribution of suicide cases was found to be uneven during the calendar year and a peak in the number of suicide cases in early summer (Bozsonyi et al., 2017, Lantos et al., 2021), during warmer weather (Tőro et al., 2009, Bozsonyi et al., 2020, Seregi et al., 2017), on Mondays, and New Year's Eve. During Easter and on Christmas Day, suicides were less frequent, but only for men. However, national holidays did not influence the frequency of suicide (Zonda et al., 2008).

Significant seasonality in death rates from suicide was identified, with a peak in late June to July. Non-violent suicides peaked in early June, with the peak of violent methods following half a month later (Bozsonyi et al., 2017, Lantos et al., 2021). Furthermore, a more marked seasonal variation was observed for suicides committed with violent methods, compared with non-violent suicides (Lantos et al., 2021). Specifically, violent methods showed a 25% higher amplitude in seasonal fluctuation compared to non-violent methods, with peaks occurring primarily in late spring and early summer months.

The impact of warm temperatures on suicide rates was evident, with a higher frequency of suicidal deaths during periods of warm weather (Tőro et al., 2009). Bozsonyi et al. (2017) first did not find a significant direct relationship between the number of hours of sunshine and the number of committed suicides, yet, in their 2020 study, they identified a weak yet statistically significant relationship between daily sunshine duration and daily changes in temperature with suicide rates. Specifically, they found a correlation coefficient of 0.11 ($p < 0.01$) between sunshine hours and daily suicide counts, suggesting a small but measurable effect (Bozsonyi et al., 2020). This discrepancy could be attributed to the aggregate ecological data used in these studies, which does not allow for the detection of individual causal relationships. The correlations found can be considered as indirect evidence of the relationship between weather conditions and suicide. Another study also demonstrated a weak but statistically significant positive correlation ($r = 0.08$, $p < 0.001$) between daily sunshine duration and suicide numbers on the same and subsequent days (up to 11 days). The researchers concluded that sunshine appears to have a prompt but distinctly weak increasing effect on suicide risk, particularly for violent suicide methods among males. Sunshine has a prompt but distinctly weak increasing effect on suicide risk (especially violent cases in males) (Seregi et al., 2017).

The impact of solar and lunar phenomena on suicide risk was also investigated. Suicide risk during proton solar events significantly increased among women aged 20–49 years. On the other hand, a slight but significant decrease in suicide risk was observed among women aged 50–59 years during magnetic storms and full moons (Kmetty et al., 2018).

Drinking water contamination

The relationship between drinking tap water contaminants and suicide rates was examined in two studies (Izsak et al., 2022, Rihmer et al., 2015). A significant negative association was established between lithium levels and the standardised suicide mortality ratio in the total population and among males, respectively. By contrast, no such preventative association was found among females (Izsak et al., 2022). By contrast, when the impact of arsenic-contaminated drinking water consumption was investigated, a positive association with age-standardised suicide rates was found (Rihmer et al., 2015).

However, both studies share identical limitations. They rely on aggregated (i.e., non-individual) data that may lead to the 'ecological fallacy'. Furthermore, no data were collected on differences in bottled water consumption, which can influence individual exposure.

COVID-19

Suicide mortality increased significantly during the COVID-19 pandemic compared to the pre-pandemic trend (Lantos and Nyári, 2022, Osváth et al., 2021). This increase was observed overall and was particularly notable among males (Osváth et al., 2021, Lantos and Nyári, 2022). Higher rates were also reported among individuals who had completed only primary education (Lantos and Nyári, 2022), as well as among those aged over 25 years (Lantos and Nyári, 2022, Balint et al., 2023). The number of suicides in the 25–64 age group increased significantly during the COVID months of 2020. Similar patterns were observed in the population aged 65 or older and among males aged 25–64, but at lower significance levels (Lantos and Nyári, 2022). The number of violent suicides also rose significantly during the COVID months (Balint et al., 2023). The number of male suicides increased significantly during

the pandemic by 18% compared to the expected numbers based on the pre-COVID-19 trend (Osváth et al., 2021). At the same time, suicide among females did not differ significantly from the expected trend (Osváth et al., 2021, Lantos and Nyári, 2022). In contrast to these findings, studies from other countries found either no change or a decrease when comparing COVID-19 suicide numbers with suicide rates from the pre-COVID-19 period (Osváth et al., 2021).

Socioeconomic and demographic factors

Gender and age

Four articles examined the influence of age and gender on suicide and suicidal ideation in Hungary (Lantos et al., 2021, Bálint et al., 2016, Havasi et al., 2005, Fekete et al., 2005). Two of the studies in question (Lantos et al., 2021, Bálint et al., 2016) utilised databases covering the entire country, whereas the remaining two articles (Havasi et al., 2005, Fekete et al., 2005) relied on data from local university clinics, mortality records, and autopsy reports from two major cities. A significantly higher suicide risk was found in men than in women, and it increased with age and decreased with education level. The male-to-female ratio of committed suicides was around 70:30, reflecting male dominance (Lantos et al., 2021, Havasi et al., 2005). During the 1995–2017 period, a total of 60,210 suicide deaths were registered in Hungary, with 76% being men and 24% being women (Lantos et al., 2021). In Hungary's third-largest city, Szeged, between 1991 and 2000, a total of 719 suicide deaths were recorded, with 70% being men and 30% being women (Havasi et al., 2005). In contrast, Fekete et al. found female dominance (63%) when analysing 1,158 suicide attempts (Fekete et al., 2005). Despite the high rates of attempted suicides, the rates of completed suicides were relatively low among young men and young and middle-aged women. However, a limitation of this study is that it only included medically treated suicide attempters, excluding those who did not seek medical treatment, which is estimated to be approximately 20-30% of all attempters. These findings are also specific to the Pécs in Hungary and may not be generalisable to other populations or regions (Fekete et al., 2005).

Marital status, employment and educational attainment

Among women, the main risk factors for suicide included being retired or economically inactive (Fekete et al., 2005), widowed (Fekete et al., 2005, Bálint et al., 2016, Lantos et al., 2021), divorced (Fekete et al., 2005, Bálint et al., 2016, Lantos et al., 2021), or having a history of depression (Fekete et al., 2005). Female suicide attempters were mainly repeaters. On the other hand, a 'typical' male suicide attempter could be characterised as unemployed (Fekete et al., 2005), living alone (Fekete et al., 2005, Bálint et al., 2016, Lantos et al., 2021), never having been married (Fekete et al., 2005, Bálint et al., 2016, Lantos et al., 2021), and struggling with addiction (Fekete et al., 2005).

Further, marital status and educational attainment were also found to be associated with suicide rates (Fekete et al., 2005, Bálint et al., 2016, Lantos et al., 2021, Almasi et al., 2009). Being widowed or divorced is among the main risk factors for suicide for women (Fekete et al., 2005). Similarly, men living alone, never having been married, exhibited a higher risk for suicide (Fekete et al., 2005, Almasi et al., 2009). Furthermore, low education levels are also correlated with suicide (Almasi et al., 2009). Higher educational attainment and marriage were significantly associated with lowered suicide risk (Bálint et al., 2016, Lantos et al., 2021). The

effects of marital status and educational attainment on suicide were larger in males (Bálint et al., 2016). Marriage was a protective factor against suicide (Lantos et al., 2021).

Another main risk factor was unemployment among men and being retired or financially inactive for women (Fekete et al., 2005, Fountoulakis et al., 2014). Unemployment might be linked with suicidality in the general population with a 3-5-year delay, meaning that increases in unemployment rates were associated with increases in suicide rates approximately 3-5 years later rather than immediately. This suggests a complex, long-term relationship between economic factors and suicide risk. The economic crisis might increase overall suicidality, rather than specifically in unemployed people (Fountoulakis et al., 2014).

The relationship between suicide mortality rate and political integration was found to be negatively correlated, while the mortality rate and the lack of religious integration demonstrated a positive association. The lack of social integration (political and religious) may also contribute to the notable spatial heterogeneity of suicide cases in Hungary (Balint et al., 2014). This heterogeneity is evidenced by significantly higher suicide rates in the southeastern regions (particularly the South Great Plain) compared to western regions, with differences of up to 3.5-fold between counties with the highest and lowest rates.

Individual factors and mental health

In addition to external factors, such as environmental or socioeconomic and demographic elements, it is equally important to consider the role of individual factors. Out of the 29 articles, twelve discussed individual factors and mental health issues, including depression (Fekete et al., 2005, Elek et al., 2022, Sánta et al., 2020, Bácskai et al., 2012), hopelessness (Chang, 2017), ADHD (Bácskai et al., 2012, Balazs et al., 2014, Kakuszi et al., 2018), antidepressant use (Kalmar et al., 2008, Döme et al., 2011), substance use (Fekete et al., 2005, Havasi et al., 2005, Bácskai et al., 2012), IBS (Sánta et al., 2020) and physical health (Elek et al., 2022).

Depression, hopelessness and antidepressant use

According to the identified studies (Fekete et al., 2005, Elek et al., 2022, Sánta et al., 2020, Bácskai et al., 2012), depression has an impact on increasing suicide and suicidal ideation. Findings indicate that depression is the primary factor influencing suicide risk (Sánta et al., 2020). Depression and its symptoms had a small but significant effect on increasing suicidal ideation (Elek et al., 2022). A history of depression was also identified as one of the main risk factors for women (Fekete et al., 2005). Moreover, individuals with ADHD who are dependent on drugs exhibit more severe symptoms of depression compared to those without ADHD (Bácskai et al., 2012).

Factors that explain depressive symptoms include the degree of hopelessness (Sánta et al., 2020). Chang's cross-sectional study (Chang, 2017) also found that hopelessness and hope uniquely predicted suicide ideation among Hungarian college students – hopelessness hurt, and hope helped. High hopelessness with low hope was especially bad for suicidal ideations. On the other hand, high hope buffered the negative effects of hopelessness on suicide ideation. High-hope students who experienced high hopelessness reported lower suicide ideation than those experiencing low hopelessness (Chang, 2017).

There is a strong negative association between antidepressant use and overall suicide rate in both men and women, especially in individuals aged 70 and above (Döme et al., 2011, Kalmar

et al., 2008). However, this protective effect is absent in the youngest age group, suggesting a nuanced impact across different age groups (Kalmar et al., 2008, Döme et al., 2011). Antidepressant use remained a strong predictor of reduced suicide rates even after controlling for factors such as divorce rate and unemployment rate. However, this relationship was no longer statistically significant after controlling for alcohol consumption, suggesting potential interactions between these variables.

Attention-deficit/hyperactivity disorder

ADHD was found to exhibit an increased risk of suicidality in treatment-naïve children and adolescents (Balazs et al., 2014) and a significantly higher likelihood of suicidal ideation in females (Kakuszi et al., 2018). In contrast to women, there was no significant difference in males with ADHD (Kakuszi et al., 2018). Furthermore, drug-dependent patients with ADHD displayed significantly higher rates of suicidal attempts and suicidal ideation compared to those without ADHD (Bácskai et al., 2012). The small sample sizes and the employed study designs could restrict the generalisability of these studies.

Substance use

The results were not consistent when exploring the role of addiction in suicide and suicidal ideation. Fekete et al. (2005) identified addiction as one of the main risk factors among men. Additionally, Havasi et al. (2005) found that 60% of all males and 18% of all females who died by suicide showed pathological signs of chronic alcoholism. In contrast, Dome et al. (2011) found no association between alcohol consumption and suicide rate, though they did observe a significant positive association between annual tobacco consumption and suicide rate.

Childhood abuse

Being victimised during childhood by parents increased the likelihood of attempting suicide in adulthood. This effect was more pronounced in females, where the risk of suicide was found to be approximately fifteen times greater than among females without a childhood abuse history. In contrast, the increase in males with a childhood abuse history was nearly double compared to males without such a history (Bácskai et al., 2009).

Other individual factors

The suicide risk among individuals with irritable bowel syndrome was notably high. In examining a sample of 300 participants living with IBS, it was found that 5.3% of patients showed a particularly high level of suicide risk (Sánta et al., 2020).

No association was found between dietary patterns, sport-related habits, and suicidal ideation or behaviour (Elek et al., 2022). On the other hand, disruption of the circadian rhythm and the sleep cycle had a significant effect on suicidal ideation. The study found that among participants reporting sleep disturbances, 38% exhibited suicidal ideation compared to 15% in those without sleep disturbances ($p < 0.001$), demonstrating a strong association between sleep disruption and suicidal thoughts (Elek et al., 2022).

Protective factors

The articles included in this review revealed not only risk factors for suicide and suicidal ideation but also identified protective factors that are associated with decreased risk of suicide.

Female gender (Bálint et al., 2016), higher educational attainment (Bálint et al., 2016, Lantos et al., 2021), younger age, and marriage (Bálint et al., 2016, Lantos et al., 2021) were all significantly associated with lowered suicide risk. Improvement in educational level contributed considerably to reducing suicide rates in men by approximately a third (Balint et al., 2020). High hope served as a buffer against the negative effects of hopelessness on suicide ideation (Chang, 2017). There was a strong negative association between antidepressant use and suicide rate (Kalmar et al., 2008, Döme et al., 2011), with the protective effect most evident in the 70 and older age groups (Kalmar et al., 2008). Women aged 50–59 years appear to have a slightly but significantly lower suicide risk during magnetic storms and full moons (Kmetty et al., 2018). Lastly, there was a significant negative association between lithium levels in drinking water and standardised suicide mortality ratio in the total population and among males (Izsak et al., 2022).

Discussion

This scoping review revealed that the factors contributing to suicide and suicidal ideation in Hungary are multifaceted and complex. The identified factors can be categorised into three main themes: environmental, socioeconomic, and individual factors.

This review identified that antidepressants have a primarily age-dependent effect on completed suicides. A protective effect is evident in the 70 and older age groups and absent in the youngest age group (Kalmar et al., 2008, Döme et al., 2011). At present, there is ongoing scientific debate concerning the impact of antidepressant treatment on the risk of broadly defined suicidality, such as suicidal thoughts, behaviour, and attempts, as well as completed suicide (Döme et al., 2011). A comprehensive review of antidepressants identified a slight increase in suicidality risk (inducing suicidal thoughts and suicide attempts) for individuals under the age of 25 (Möller et al., 2008).

This review revealed that the risk of suicide decreases with age (Lantos et al., 2021, Bálint et al., 2016, Havasi et al., 2005). Today's post-industrial societies (especially in Europe) must face a demographic crisis of the ageing of the population. This will have a significant effect on the burden of suicide, which will need to be addressed (Churski et al., 2021). Further, more targeted studies are required to investigate suicidal behaviour in older age, especially the relationship between risk factors and suicide attempts and completed suicides in subjects above 65 in Hungary. Our research team is planning a follow-up study specifically focused on suicide risk factors in the elderly Hungarian population, with particular attention to isolation, chronic illness, and access to mental healthcare services (Beghi et al., 2021).

National holidays did not impact the frequency of suicide. On religious holidays (such as Easter and Christmas), alcohol consumption increases, especially for men. It would be expected that suicidal behaviour should also increase on these holidays. However, the data indicate no change in suicidal behaviour in women and, at the same time, a decrease in men (Zonda et al., 2008). It would be of great interest to compare the present results in countries where Buddhism and Islam are the dominant religions, given their contrasting views on alcohol consumption.

In 2020, only Lithuania registered higher suicide rates (21.3 per 100,000 people) than Hungary (17.1) among the EU countries (The World Bank, 2023). Both countries struggle with similar issues, e.g., the transition from Soviet rule and economic instability. The demographic situation that has developed in Hungary over the decades reflects the demographic phenomena that can be observed primarily in developed European countries. Still, some of its characteristics are naturally related to the political changeover that occurred in Eastern Central Europe, and its prolonged nature is specifically Hungarian (KSH Population Research Institute, 2024).

There were several limitations to this scoping review that are worth noting. First, screening records, assessing articles for eligibility, and extracting data were conducted by a single reviewer. The requirement of a second reviewer in scoping reviews, however, is recommended by JBI (Tricco et al., 2016). Second, due to the lack of longitudinal studies and the abundance of cross-sectional studies, causality between the identified factors and suicide outcomes could not be revealed. Furthermore, studies utilising aggregate data are subject to limitations due to ecological fallacy, which limits the ability to establish conclusions on an individual level. Third, the inclusion criteria limited publications to original studies only. Due to the timescale and scope of this review, grey literature and review articles were not searched and included. Including grey literature in this review may have provided a more comprehensive view of the available evidence. As such, there is a possibility that relevant data have been excluded from this review.

This scoping review highlights that the existing evidence on suicide and suicidal ideation is limited in the context of access to health care, the role of community-based prevention, mental health issues other than depression or ADHD, and among groups of minorities. Therefore, more robust analytical research designs such as case-control and psychological autopsy methods, are needed with a focus on risk factors, particularly access to health care; there is also a need for intervention studies for suicide prevention of suicidal ideation.

Conclusion

This scoping review aimed to map the existing literature on the main factors responsible for suicide and suicidal ideation in Hungary to better understand the factors behind the historically high suicide rates in the country. Socioeconomic and demographic factors, mental health conditions, environmental factors and seasonality were the main themes that emerged from the articles. Although the numbers have improved for decades, they still seriously burden society.

The review highlights the need for further research into the complex, multicausal phenomenon of suicide and the unique characteristics of Hungary's high suicide statistics. To better understand the background mechanisms, the next practical step would be to conduct a systematic review to understand the precise relationships between specific factors and suicide rates in Hungary.

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Details of the articles included in this review are presented in Appendix 1 on the following pages.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Kalmar et al., 2008	national mortality data 1999-2004 period all age groups	national database	antidepressant use	trend analysis	mortality data prescription data	There is a strong association between antidepressant use and suicide rate in both men and women. The protective effect is most evident in the 70 and older age groups and absent in the youngest age group. Antidepressant use was a strong predictor of lowering the suicide rate.	Quasi-experimental design may introduce confounding factors and limit the ability to establish a causal relationship between antidepressant use and suicide rates.
Elek et al., 2022	N = 763 N = 617 women age: 18-80 years data collection:	Nationwide	COVID-19 sleep depression diet	cross-sectional	online questionnaire	No association found between diet-specific and sport-	No limitations acknowledged by the authors.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
	April 2020-March 2021		physical activity			related habits and suicidal ideation. Depression had a small but significant effect, increasing suicidal ideation. Disruption of circadian rhythm had a significant effect on suicidal ideation.	A cross-sectional study design limits the ability to establish causal relationships between the variables.
Bálint et al., 2016	Nationwide databases data from 1980, 1990, 2001 and 2011 age: >20 years	national databases	marital status educational attainment gender age	Repeated cross-sectional study	census data Hungarian Demographic Register database	Female gender, higher educational attainment, younger age and marriage were significantly associated with lowered suicide risk. The effects of marital status and educational attainment on	Ecological study design limits the ability to establish causal relationships between the variables. Categories used in the study for marital status may not cover the entire range

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						suicide were more prominent in males.	of marital statuses in a modern society.
Balazs et al., 2014	N = 418 age: 3–18 years Child Psychiatric Hospital, Budapest	Budapest	ADHD	cross-sectional	structured interview	ADHD symptoms are linked with an increased risk of suicidality in treatment-naïve children and adolescents.	Cross-sectional design limits the ability to establish any causal relationship between the investigated factors. A treatment naïve clinical sample may represent a less severe end of the spectrum.
Osváth et al., 2021	observed number of suicides March-December 2020 vs. The expected number of suicides was	national database	COVID-19	interrupted time-series	mortality records	Overall and male suicides increased significantly during the pandemic compared to the expected	Methodology: not suitable to provide clear evidence of a causal relationship between

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
	calculated between 2010 and 2020 N=21,463					numbers (by 16 and 18%). Suicide among females did not differ significantly from the expected trend. This contrasts with findings from other countries, where no change or decrease was found.	COVID-19 and the rising suicide rate or to help identify the factors that mediate this possible relationship.
Balint et al., 2020	data from the national statistical database 1990 vs 2011	national database	educational level	unlinked cross-sectional analysis	national statistical records	Improvement in educational level contributed significantly to reducing suicide rates in men (by about 30%). The impact of educational attainment on women's suicide rates was notably	"Unlinked data" was used, which can lead to the so-called "numerator-denominator bias", leading to inaccurate estimates

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						smaller (13.0%).	
Havasi et al., 2005	Period: 1991-2000 N = 719 (men: 501, women: 218) age: 16-93 years	Szeged	Age gender alcohol consumption	retrospective observational study	autopsy records	In men, the largest age group was 41-50; in women, there was a "double-peak" of age groups 41-50 and 71-80. Male-to-female ratio = 70:30, male dominance. 60% of all males and 18% of all females showed pathological signs of chronic alcoholism.	No limitations acknowledged by the authors. The study may have a relatively small sample size, which could limit the generalisability of the findings to the larger population.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Fekete et al., 2005	N = 1,158 registered suicide attempts Period: 1 July 1997 to 30 June 2001 age: 14-89 years	Pecs	gender unemployment marital status addiction depression	retrospective observational study	mortality records, University Clinic records	Main risk factor for women: retired or economically inactive, widowed, divorced, or with a history of depression. Female attempters were mainly repeaters. Main risk factors among men: unemployment, living alone, never married, and problems with addiction.	Only included information about medically treated suicide attempters, which may not represent the entire population of attempters. Multiple attempts may have influenced the results of statistical analysis (via being evaluated numerous times).
Chang, 2017	N = 395 college students (206 women, 189 men) public university age: 18-30 years	Budapest	hopelessness	cross-sectional	survey	Both hopelessness and hope uniquely predicted suicide ideation Hopelessness hurt, hope	Cross-sectional design limits the ability to establish any causal relationship between the investigated

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						helped, and high hopelessness with low hope was especially bad for suicidal ideations. High hope buffered the negative effects of hopelessness on suicide ideation.	factors. The study was conducted with college students; this limits the generalisability of the results to other populations.
Sánta et al., 2020	N = 300 patients with IBS (men 47%, women 53%) age: 18-65 years	Budapest, Szeged, Pecs	IBS	cross-sectional	self-filling questionnaire	5.3% of patients with IBS showed a particularly high level of suicide risk. Findings indicate that depression is the primary factor influencing suicide risk.	Self-filled questionnaires – assessment by professionals is missing.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Izsak et al., 2022	age- and gender-standardized mortality ratio for suicide by districts (N = 197) tap water lithium level (N = 1,325)	national database	drinking water	time-series analysis	national statistical records	There is a significant negative association between lithium levels and the standardised suicide mortality ratio in the total population and among males, respectively. No such preventative association was found among females.	Aggregate district-level data, which may lead to the 'ecological fallacy'. The results may not necessarily hold at the individual level. There is no data on bottled water consumption, which can influence individual lithium exposure.
Balint et al., 2014	N=17,384 suicides from the national database Period: 2005-2011 age: 15-64 years	national database	political integration religious integration	cross-sectional	national statistical records election records	Mortality rate was significantly associated with the 'political integration' variable in a negative and with the 'lack of religious	Aggregate district-level data, which may lead to the 'ecological fallacy'. The results may not necessarily hold at the

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						integration' and 'disability pensionary' variables in a positive way. The lack of social (political and religious) integration may be responsible for the notable spatial heterogeneity of suicide cases.	individual level.
Kmetty et al., 2018	National databases N = 130,860 committed suicides female N = 36,084, male N = 94,776 Period: 1976-2010	national database	Solar and lunar phenomena	time-series analysis	national statistical records meteorological database	Among women aged 20–49 years: significant increase in suicide risk during proton solar events. Among women aged 50–59 years, a slight but significant decrease in suicide risk during magnetic	Ecological analysis: aggregate data may lead to the 'ecological fallacy'. The results may not necessarily hold at the individual level. Relatively rare events were examined.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						storms and full moons.	
Lantos et al., 2021	N = 60,210 Period: 1995–2017 annual population data and the monthly birth and death data from the nationwide population register	national database	age gender educational level marital status seasonality	time-series analysis	national statistical records	Significantly higher suicide risk in men than in women, increased with age and decreased with educational attainment. Marriage was a protective factor against suicide. Significant seasonality in suicide rates: peak in late June. Non-violent: early June; violent: half a month later.	Data obtained from vital registers: there may be cause-of-death biases (e.g., youth suicides recorded as fatal traffic accidents).

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Fountoulakis et al., 2014	National statistical records on suicides and unemployment Period: 2000-2011	national database	Unemployment	time-series analysis	national statistical records	Unemployment might be linked with suicidality in the general population with a 3-5 5-year delay. The economic crisis might increase overall suicidality, rather than specifically in unemployed people.	Analysis based on population data: overlapping of populations is significant; the degree of overlapping of unemployed populations is unknown.
Rihmer et al., 2015	2005 and 2011 settlements with a population over 500 (N = 1639)	national database	drinking water	cross-sectional	national statistical records	Positive association between age-standardized suicide rates and consumption of arsenic-contaminated drinking water. Consumption of arsenic-contaminated drinking water may be associated	Aggregated (i.e., non-individual) data may lead to the 'ecological fallacy'. There is no data on bottled water consumption between settlements, which can influence

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						with suicidal behaviour.	individual exposure.
Törö et al., 2009	N = 4,918 (3,099 male, 1,819 female) suicidal deaths Period: 1995-2004.	Budapest	temperature	time-series analysis	police records autopsy records meteorological databases	Suicide rates were influenced by warm temperatures. A higher frequency of suicidal deaths was found in warm weather with low relative humidity.	No limitations acknowledged by the authors. The study relied on aggregated data; this limits the ability to establish conclusions on an individual level.
Bozsonyi et al., 2017	Period: 1971–2000 Sunshine hours Completed suicides (N = 127,877)	national database	sunshine	time-series analysis	National statistical and meteorological records	There is no significant direct relationship between the number of hours of sunshine and the number of committed	No limitations acknowledged by the authors.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						suicides. There is no correlation between the number of hours of sunshine and the number of violent suicides, either.	
Almasi et al., 2009	N=194 suicide deaths N = 194 control Period: 2002–2004)	Budapest, Pest County	marital status educational level unemployment religion	controlled psychological autopsy study	interview - family members of the deceased	Factors found associated with suicide: being unmarried or no current relationship, lack of social contacts, low education level, history of self-harm, unemployment, changes in living standards, or practising religion.	Psychological autopsy design does not allow the establishment of a causal relationship between the identified factors and suicide.
Lantos et al., 2019	N = 53,769 suicide deaths (national statistical database)	national database	seasonality	time-series analysis	national statistical records	Seasonality in death rates from suicide/self-	Data collected from vital registers

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
	Period: 1995-2014					harm: peak in June to July.	which could have been influenced by a simplification in categorization during the study.
Kakuszi et al., 2018	N = 103 patients N = 103 controls Data collection: 2012-2017	Budapest	ADHD gender	cross-sectional	interview	Compared to controls, the likelihood of suicidal ideation was significantly higher in females with ADHD. The difference was not significant in males.	The study was limited to a clinically-referred population, which limits the generalisability of the findings. Limited sample size – restricted statistical power to compare controls with subgroups of ADHD patients.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Bácskai et al., 2009	N = 172 alcohol dependent patients Data collection: August-October 2005 age: 18-65 years	Budapest	childhood abuse	cross-sectional	face-to-face interview	In females, being victimised during childhood by their parents increased the likelihood of attempting suicide by around fifteen times. In males, the increase was approximately double.	Cross-sectional design limits the ability to establish any causal relationship between the investigated factors. The small sample size and the specific geographically defined catchment areas may limit the generalisability of the findings.
Balint et al., 2023	N = 10,179 completed suicides Period: 2015-2020	national database	COVID-19	interrupted time-series	national statistical records	The number of suicides in the 25–64 age group increased significantly during the COVID months of 2020. Similar	Non-individual level data used and therefore unable to control several risk and protective factors at the

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						patterns were observed in the population aged 65 or older and among 25-64-year-old males, but at lower significance levels. The number of violent suicides rose significantly during the COVID months.	level of individuals.
Bozsonyi et al., 2020	N = 91,509 suicide data from the national database sunshine duration Period: 1971-2013	Southeast Hungary	sunlight	time-series analysis	National statistical and meteorological records	Daily sunshine duration and daily changes in temperature displayed a weak yet statistically significant relationship with suicide rates.	Used aggregate, ecological data: individual causal relationships cannot be detected.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Zonda et al., 2009	N = 133,699 suicide data from the national database Period: 1970-2002	national database	public holidays	time-series analysis	national statistical records	More suicides were committed on Monday and fewer on the weekends in both males and females. On New Year's Day, more suicides were committed than expected. Easter Sunday/Monday and Christmas Day suicides were less frequent, but only for men—no change in suicidal behaviour in women. National holidays did not influence the frequency of suicide.	No limitations acknowledged by the authors. Despite the high-quality vital statistics performance index and low rates of garbage-coded deaths in Hungary, there may be cause-of-death biases.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Lantos and Nyári, 2022	number of suicides (pre-vaccination): March–Dec 2020) vs expected numbers without COVID-19 (monthly data from January 2010 to February 2020).	national database	COVID-19	interrupted time-series	national statistical records	Suicide mortality increased significantly compared to the pre-pandemic trend: overall, among males, among vocational school graduates, and especially in the 35–49 years age group. Significant growth in suicide rates was detected in the two regions with the lowest COVID mortality rates.	Possible ecological fallacy: Individual-level associations may not always be reflected in ecological-level associations.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
Döme et al., 2011	Suicide data from the national database alcohol and tobacco records	national database	tobacco antidepressants	time-series analysis	national statistical records	A significant positive association between annual tobacco consumption and suicide rate. Negative significant association between antidepressant use and suicide rate. No association between alcohol consumption and suicide rate.	Ecological study design limits the ability to establish causal relationships between the variables. Monitored only completed suicides, but not other forms of suicidal behaviour (i.e., suicide ideations and attempts).
Bácskai et al., 2012	10 drug centres outpatients age: 18 -40 years Period: Jan-May 2007	Budapest and other cities	ADHD	cross-sectional	face-to-face interview	Drug-dependent patients with ADHD displayed significantly higher rates of suicidal ideation and suicidal attempts and	No further diagnostic instruments or psychometric assessments were used for ADHD classification. A relatively small sample

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						more severe depression symptoms than the ADHD-negative group.	size may limit the generalizability of the findings.
Seregi et al., 2017	N = 122,116 suicide data from the national database daily sunshine duration Period: 1979-2013.	national databases	sunlight	time-series analysis	national statistical records National Meteorological Database	Daily sunshine duration and suicide numbers on the same day indicated a weak but highly significant positive correlation. Positive significant correlations between suicide risk and averaged sunshine duration in the previous days (up to 11 days). Sunshine has a prompt but distinctly weak increasing	The study relied on aggregated data and had no data on the sunlight exposure of individual suicide victims before their final act; that may be the source of 'ecological fallacy'.

First Author and Year	Population/setting	Location	Main factors	Study method	Data sources	Main findings	Key limitation
						effect on suicide risk (especially violent cases in males).	