

Review Article

Suicidal Behavior and Suicide Research during COVID-19 Pandemic in Muslim-Majority Countries: A Rapid Review

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Abstract

Background and Objectives: Understanding the impact of the COVID-19 pandemic on suicide and the extent of research would help to identify the potential areas of further research and prevention of suicide during pandemics. We aimed to assess suicidal behavior and the extent of suicide research during the pandemic in Muslim-majority countries.

Materials and Methods: We searched Medline, Embase, and PsycINFO with search terms in different combinations. We also searched Google and Google Scholar to identify other available papers.

Results: A total of 29 studies were included in this review from nine Islamic countries. The maximum number of studies was published from Bangladesh [16], followed by Iran [4], and Pakistan [3]. Twenty (69%) papers were published as original contributions, and eight (27.6%) as letter to the editors. The sample size ranged from 80 (Bangladesh) to 145510 (Kazakhstan) in the studies. Data were collected through an online survey and media reports (newspaper and/or television) in twelve (41.4%) studies each. The prevalence of suicidal behavior varies from 5-48%. Economic hardship due to the COVID-19 pandemic, fear of infections, COVID-19 and its containment measures, COVID-19-related stress, and stigma towards it were noted as COVID-19-related risk factors. Increased suicidal behavior was noted in Kazakhstan whilst a reduction was noted in Bangladesh.

Conclusion: The review identified a dearth of high-quality research on suicidal behavior in Muslim-majority countries during the COVID-19 pandemic. Additionally, it gives an inconclusive picture regarding the impact of the pandemic on suicidal behavior in Islamic States.

Keywords

Suicide, COVID-19, Muslim countries, Suicide research, Pandemic, Corona virus

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Introduction

The ongoing COVID-19 pandemic incurs devastating consequences for both physical and mental health. A robust body of evidence points to a considerable burden of psychological morbidity among the general population as well as subpopulations like health care workers, students, and COVID-19 survivors [1, 2]. As the pandemic stresses economies and overwhelms health care, social support, and security systems, studies from some countries have documented a rise in suicidal behaviors following the outbreak of the pandemic [3-5]. However, the rise of suicidal behavior has not been substantiated while assessing good quality epidemiological data [6, 7]. An important study from 21 countries (high income-16, upper-middle-income-5) doesn't support the general notion of increasing suicide from the beginning of the pandemic [8]. However, the majority of studies reported data from developed countries. Although about 77% of suicides are happening in low and middle-income countries (LMICs), suicide research is disproportionally low in the latter. One bibliometric review identified that among the top ten countries on suicide research during the COVID-19 pandemic, there are only three countries with LMICs background (India, China, and Bangladesh) where Bangladesh is the only Muslim country [9]. As suicide is a multi-factorial phenomenon, there is a need to investigate the risk factors for suicide-related behaviors during the pandemic to guide prevention efforts and resource allocation.

Based on population, Islam is the second-largest religion consisting of 49 countries/territories mostly situated in Asia and Africa with LMIC backgrounds [10]. The incidence of suicide mortality is lower in Muslim-majority countries compared to non-Muslim nations, but this disparity attenuates when suicide ideation or attempts are considered [11-15]. In addition to the inadequate suicide research in Muslim-majority

nations; much of the research is simple descriptive studies of suicide decedents or suicide attempters. Furthermore, there is possible underreporting and misclassification of suicide due to the illegality of the behavior and lack of suicide registration systems that hinder suicide research [16, 17].

Suicide prevention during the COVID-19 pandemic requires knowledge about its impact on suicide rates and possible determinants. For Muslim countries, such data provides an opportunity to study suicide trends and between-country variations that are crucial to understand socioeconomic and ethnic differences and initiating policy measures [16]. Therefore, we aimed to assess suicidal behavior and the extent of suicide research during the pandemic in Muslim-majority countries that would help to identify the potential areas of suicide prevention such as any religion-specific risk or resilience factors and readiness to formulate prevention strategies.

Methods

Search Strategy

A search was conducted in Medline, Embase, and PsycINFO on February 17, 2022 with search terms in different combinations (Supplementary file 1) to identify the published articles reporting suicidal behavior in Muslim majority countries. We also performed a hand search in Google and Google Scholar with the search term "suicide during COVID-19 in Muslim countries" to identify the articles not included in the aforementioned databases. Additionally, we looked for articles by a snow-balling approach to trace the published articles on suicide in Muslim countries. Stepwise search details are depicted in figure 1. We extracted a list of Muslim-majority countries by searching in the *World Population Review* that identifies 49 countries/territories with a total number of country population, total number of Muslims, and proportion of Muslim population (Supplementary file 2) [10].

Inclusion Criteria

Empirical studies, quantitative studies, case reports, and case series published in the English language from Muslim-majority countries during the COVID-19 pandemic as well as letters reporting the suicide cases were included.

Exclusion Criteria

Qualitative studies, any type of reviews, commentary, correspondence, viewpoints, and editorials without reporting any primary data as well as letters to the editor without reporting any primary data were excluded.

Data Abstraction

The search identified 29 published articles during COVID-19 pandemic in all 49 Muslim countries/territories from the beginning of the pandemic to search date. The articles were listed in the *Microsoft*

Excel software for Windows (version 10). We extracted the author names, year of publication, country where the study conducted, study design, type of the paper, study period, study population, data collection technique, and major findings related to the suicidal behavior during the COVID-19 pandemic. We extracted the values from the published articles.

Statistical Analysis

We performed descriptive statistical analysis in the Microsoft Excel software for Windows (version 10) and expressed as frequency and percentages.

Ethical Aspects

As we reviewed publicly available already published research papers, no institutional review board clearance was sought for conducting the study.

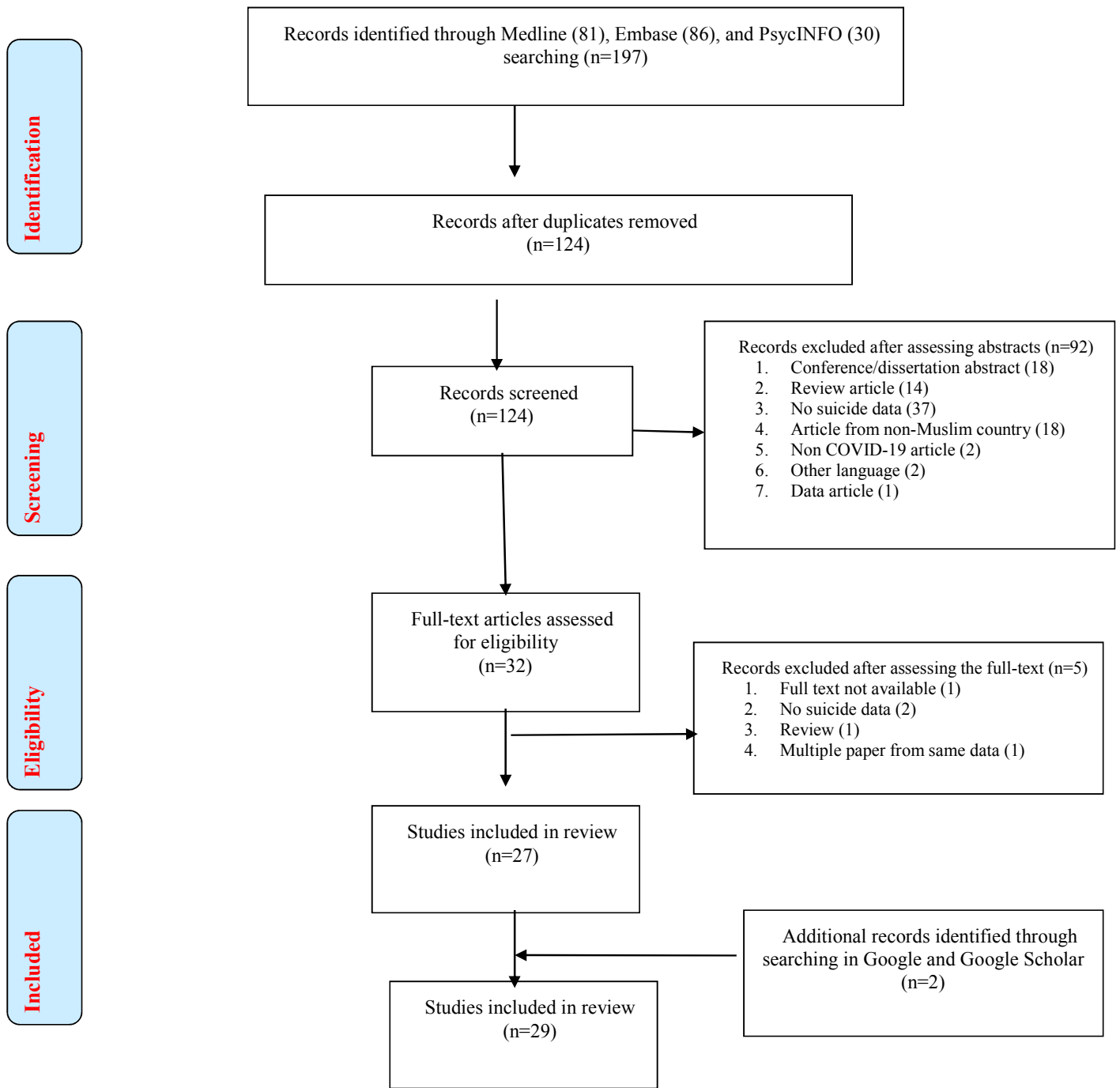


Figure 1. PRISMA 2009 Flow Diagram

Results

Distribution of Studies on Suicide in Muslim Countries during COVID-19 Pandemic

A total of 29 studies were identified from nine Muslim-majority countries. The detail variables extracted from the articles are presented in table 1 & 2 and figure 2. The maximum number of studies was

published from Bangladesh (55.2%, n=16), followed by Iran (13.8%, n=4), and Pakistan (10.3%, n=3), whilst only one paper each was identified from Iraq, Kazakhstan, Libya, Malaysia, Qatar, and Saudi Arabia. The majority of the papers were published in 2021 (65.5%, n=19), followed by 2020 (27.6%, n=8), and the rest two articles were published in 2022 from Bangladesh.

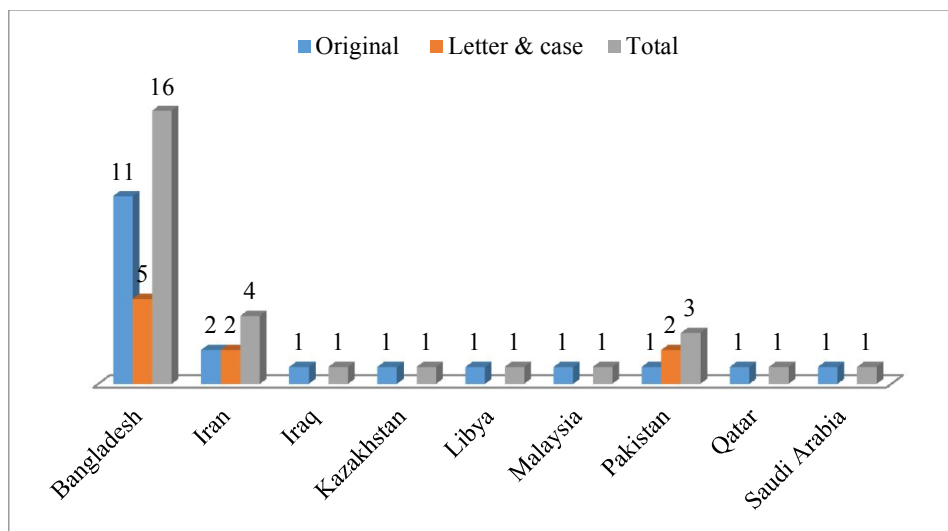


Figure 2. Country-wise distribution of articles on suicidal behavior during COVID-19 pandemic in Muslim-majority countries

Characteristics of Studies on Suicide in Muslim Countries during COVID-19 Pandemic

Among the 29 papers, 20 (69%) articles were published as original contributions (Table 1), eight (27.6%) as letter to the editor (LTE), and the rest one was published as a case report from Pakistan (Table 2). Among the eight LTEs, five were published from Bangladesh, two from Iran, and the rest one is from Pakistan (Table 1). Likewise, the total papers, the maximum number of original articles were identified from Bangladesh (11), followed by Iran (2), and one original article was published from Iraq, Kazakhstan,

Libya, Malaysia, Pakistan, Qatar, and Saudi Arabia each (Table 2). Among the articles, 20 (69%) studies were conducted as a cross-sectional study, and eight papers were published as case studies (Bangladesh 4, Iran 2, and Pakistan 2). The study duration covered a wide range starting from the beginning of 2020 to the end of 2021 (Table 1).

Table 1. Summary of the articles published as case studies and letter to the editor during COVID-19 in Muslim countries (n=9)

| SN | Study | Country | Sample size | Type of paper | Study period | Study population | Data collection technique | Overall comment |
|----|--------------------------------|------------|-------------|----------------------|-----------------------|--------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Islam, 2021 [18] | Bangladesh | 2 | Letter to the editor | April and June, 2021 | Two active COVID-19 infected suicide cases | Extracted from newspaper report | In this letter, the author collected information from two English newspapers of Bangladesh reporting two active COVID-19 infected deaths by suicide. The author, likewise, the news reports indicated a monocausal explanation of suicide with the social stigma. Social stigma and covid-19 infection have been attributed as the responsible factors |
| 2 | Daria and Islam, 2022 [19] | Bangladesh | 151 | Letter to the editor | April 2020-March 2021 | Students died by suicide | A retrospective search from online media reports | This letter claimed an increased suicidal behavior among the students in Bangladesh during the COVID-19 pandemic by extracting data from online media reports without substantiating any pre-and post-estimates. Several risk factors for this increase in suicidality have been indicated that are related to the COVID-19 containment strategies such as school closure, loss of job, frustration, and increased mental disorders. |
| 3 | Bhuiyan et al., 2021 [20] | Bangladesh | 8 | Letter to the editor | April, 2020 | Suicide deaths | Extraction from media reports | This letter reported eight cases from media reports explaining a simplistic monocausal explanation of suicides with financial hardships due to the COVID-19 pandemic. It is interesting to notice that all the reported cases revealed risk factors in the financial domain. |
| 4 | Mamun et al., 2020 [21] | Bangladesh | 1 | Letter to the editor | July, 2020 | A 40-year-old hospitalized female | Extraction of data from television news | In this letter, the authors reported a suicide mentioning the personal identifying information from national television news in Bangladesh. Reportedly, this suicide has been attributed to the treatment refusal by the hospital personnel due to the fear of COVID-19 infection. |
| 5 | Mamun and Griffiths, 2020 [22] | Bangladesh | 1 | Letter to the editor | March, 2020 | suicide deaths | Extraction of data from media TV news | In this letter, the authors reported a suicide mentioning the personal identifying information from national television news in |

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|---|----------------------------|----------|----|----------------------|-------------------|----------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | | | | | | Bangladesh. This paper attributed suicide to the social stigma towards COVID-19 in a village of the country. |
| 6 | Saeed et al., 2021 [23] | Iran | 3 | Letter to the editor | | Three probable suicides of physicians | Extraction from media reports | This letter, surprisingly, reported three unconfirmed cases of suicide among physicians from media reports in Iran within a span of a week and addressed the possible risk factors and prevention strategies. |
| 7 | Pirnia et al., 2020 [24] | Iran | 2 | Letter to the editor | April, 2020 | Suicide deaths of a son and his mother | | This letter highlighted the impact of COVID-19 related change in mourning and grief rituals. It attributed a suicide of a teenage boy due to unusual grief rituals of his father who died from covid-19 as a result of COVID-19 containment strategy and social stigma towards COVID-19. After the death of the husband in COVID-19 and the son by suicide, the last member of the family died by suicide. |
| 8 | Mamun and Ullah, 2020 [25] | Pakistan | 16 | Letter to the editor | March-April, 2020 | Persons with suicidal behavior related to COVID-19 in Pakistan | Extraction of data from media | This letter described the risk factors for suicide without any explicit explanation supporting claims in the early phase of pandemic in Pakistan. Additionally, the reports were collected from media reports. Economic hardship due to covid-19 pandemic and fear of infections have been identified as the responsible factors |
| 9 | Mamun et al., 2020 [26] | Pakistan | 3 | Case report | June-July, 2020 | Three suicides (16-20 years male) | Extraction of data from press media TV and Newspapers | The case report described three suicides during COVID-19 in Pakistan with a monocausal attribution to PUBG game addiction based on the media reports without considering other factors and without any opinion from mental health personnel or any objective instrument. |

Table 2. Summary of the original articles published during COVID-19 in Muslim countries (n=20)

| SN | Study | Country | Sample size | Study design | Study period | Study population | Data collection technique | Overall comment |
|----|--------------------------|------------|-------------|-----------------|------------------|---------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Rahman et al., 2022 [27] | Bangladesh | 2100 | Cross-sectional | April-May, 2021 | Adult university student | Online survey through social media (Facebook page, Facebook, messenger, WhatsApp etc) | This study assessed affecting factors of suicidal behavior among university students of Bangladesh after one year of COVID-19 pandemic where suicidal behavior was assessed by Suicidal Behaviors Questionnaire-Revised (SBQ-R). As per the instrument, 47.9% of the students were at risk of suicidal behavior. However, it doesn't report the distribution of suicidal behavior (ideation, attempt). |
| 2 | Rahman et al., 2021 [28] | Bangladesh | 1415 | Cross-sectional | 10-20 July, 2020 | Adult Bangladeshi citizen | Online survey through social media platforms (Facebook, WhatsApp) | The study reported the prevalence of suicidal behavior and associated factors among Bangladeshi adults during the early days of COVID-19 pandemic by SBQ-R. It reported that 37.5% (n=531) had suicidal behavior (ideation 19%, planning 18.5%) and as per the cut-off score of 7 for the SBQ-R, 33.5% of the respondents had suicide risk during the COVID-19 pandemic. Women gender, divorcee or widower, low educational attainment, financial hardship due to the COVID-19 pandemic, death of close persons from COVID-19, contact with COVID-19 case(s), and fear of COVID-19 infection were identified as the risk factors. |
| 3 | Mamun et al., 2021 [19] | Bangladesh | 127 | Cross-sectional | March, 2020-2021 | Bangladeshi students | Retrospective search of online media reports | The paper assessed demography, methods of and risk factors for suicide among 127 students extracting data from media reports. It revealed that female students (72.4%) were dying more than males, and hanging was the most common method of attempt (79.5%). Relationship issues (15.7%), unrestrained emotion (12.6%), not fulfilling demand (11%), familial disharmony (9.4%), academic failure (9.4%), psychiatric problem (8.7%), sexual harassment (6.3%), and parental restriction (3.9%) were identified as the attributable factors for suicide. |
| 4 | Ashraf et al., 2021 [30] | Bangladesh | 80 | Document review | March, 2020-2021 | Suicide deaths | Reviewing media reports and newspapers (seven Bangla and three English language daily newspapers) | This paper assessed the mental health impact of COVID-19 by reviewing newspaper reports and identified some major domains including suicide. Among the 201 reports, 50 conveyed the 80 |

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| | | | | | | | | suicides. It mentions family-related factors, marital disharmony, harassment, sexual violence, emotional breakdown, economic hardship, and stigma towards COVID-19 as the related factors for suicide. |
| 5 | Auny et al., 2021 [31] | Bangladesh | 324 | Cross-sectional | November, 2020 | Adult Bangladeshi citizen | Online survey | This study reported the change of physical activity and its association with mental health condition including suicidal behavior. It revealed that 6.5% (n=21) of the participants reported suicidal behavior from the starting of the pandemic to the data collection date. The paper didn't mention the frequency distribution of suicidal behavior (thought, plan, attempt), and suicidal behavior wasn't measured by any validated objective instrument. Additionally, it reports that 8.6% (n=28) of the participants had prior history of suicidal behavior which could indicate a decrease during the pandemic. |
| 6 | Mamun et al., 2021 [32] | Bangladesh | 756 | Cross-sectional | 1-13 April, 2021 | Bangladeshi young adults | Online survey through Facebook, and WhatsApp | The study investigated the prevalence and associated factors of suicidal behavior among Bangladeshi young adults during the second wave of the pandemic where suicidality was measured by the last item of the Montgomery-Asberg Depression Rating. It revealed that 8.2% (ideation 7.4%, planning 0.1%, and attempt 0.7%) of participants reported suicidal behavior during the last year. A higher COVID-19 risk, fear of COVID-19 infection, and having depressive and anxiety features were significantly related to a higher risk of suicidal behavior. |
| 7 | Islam et al., 2021 [33] | Bangladesh | 13654 | Cross-sectional | May-June, 2020 | Adult Bangladeshi citizen | Online survey distributed through social media (Facebook, Messenger, WhatsApp, etc.) | This study reported suicidal behavior, depression, and the lifestyle and daily activities measurement with various COVID-19 related factors. The study revealed 8% (n=1097) of the participants had suicidal ideation during pandemic, 13.7% (n=1865) had prepandemic suicidal thoughts, and 7.6% (n=1040) had past suicidal attempt (total 29.3% [n=4002]). The data indicates a reduction of suicidal thoughts during pandemic. However, the suicidal ideation wasn't measured by any validated and objective instrument. |

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|----|--------------------------|----------------------|-------|-----------------|----------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 | Kar et al., 2021 [34] | Bangladesh and India | 141 | Cross-sectional | January-June, 2020 | Persons with suicidal behavior | Retrospective analysis online media reports | By analyzing newspaper reports, this study assessed and compared the suicidal demographics and clinical characteristics of suicide during pre and post lockdown. The analysis revealed that hanging was significantly higher during the lockdown period in Bangladesh. A cautious note should be considered as data were collected from the media report. |
| 9 | Mamun et al., 2021 [35] | Bangladesh | 10067 | Cross-sectional | April 1-10, 2020 | Bangladeshi people aged over 10 years | Online survey using social media | This study investigated the psychological consequences (depression and suicidal ideation) during the early days of COVID 19 pandemic in Bangladesh. It reports that 5% (n=506) of the respondents had suicidal ideation. The suicidal ideation wasn't measured by any validated and objective instrument. Suicidal ideation was associated with young age, female sex, cigarette smoking, comorbid illness, a higher score on the Fear COVID-19 Scale, and insomnia. |
| 10 | Tasnim et al., 2020 [36] | Bangladesh | 3331 | Cross-sectional | April-May, 2020 | Adult university student | This survey was conducted using the Google form where a link was disseminated across different online platforms (university students' Facebook groups, online students' forums, and university blogs). | This study reported prevalence and correlations of suicidal ideation among university students in Bangladesh during early phase of COVID-19 through a web-based self-reporting survey. It revealed that prevalence of suicidal ideation was 12.8%. The study reports a rate of 18% for pre-pandemic prevalence, indicating a reduction of suicidal behavior. The suicidal ideation wasn't measured by any validated and objective instrument. |
| 11 | Mamun et al., 2020 [37] | Bangladesh | 3388 | Cross-sectional | April, 2020 | General population | A web-based study was administered through the social media platforms (Facebook, WhatsApp, Imo, etc.) | This web based assessed the prevalence and risk factors for suicidal behavior in Bangladesh during COVID-19 pandemic. It revealed that 6.1% (n=206) of the respondents reported having suicidal behavior without any difference between the general population and health care providers. Females, divorced, and persons without a child were revealed as independent predictors for suicidal behavior. The paper didn't mention the frequency distribution of suicidal behavior (thought, plan, and attempt) and suicidal wasn't measured by any validated objective instrument. |
| 12 | Lin et al., 2021 [38] | Iran | 10843 | Cross-sectional | February-April, 2021 | Adult persons living in Qazvin, Iran | Interview | The study proposed a model explaining the associations between generalized trust, fear of |

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|----|------------------------------|------------|--------|-----------------|---------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | | | | | | COVID-19, insomnia, and suicidal ideation during the COVID-19 pandemic in a large-scale Iranian sample and meticulous methods. It revealed that 20.8% (n=2252) of the participants had suicidal ideation. A higher rate of suicidal ideation was reported in females, in people with a lower educational status, married, and living in a city. Suicidal ideation was positively associated with insomnia and fear of COVID-19, and negatively associated with generalized trust. |
| 13 | Ariapooran et al., 2021 [39] | Iran | 315 | Cross-sectional | 2020 | Nurses | Census | The study assessed depression, anxiety, and suicidal ideation in nurses in response to COVID-19 trauma by several well accepted instruments. It reported that suicidal ideation was significantly higher among the nurses with Secondary Traumatic Stress. |
| 14 | Ahmad et al., 2021 [40] | Iraq | 156 | Cross-sectional | January, 2020-April, 2021 | Persons with suicidal behavior | Retrospective analysis of news reports | This study analyzed newspaper reports and reported the characteristics, methods and risk factors of suicidal behavior during COVID-19 pandemic in Iraq. Only 5 (3.2%) reports attributed suicidal behavior to COVID-19 and its containment measures. A cautious interpretation is warranted as data were collected from the newspaper reports. |
| 15 | Chayakova et al., 2021 [41] | Kazakhstan | 145510 | Observational | February-May, 2020 | Emergency medical service calls | Secondary data of emergency medical service call data | The dynamics of changes in the number of emergency medical calls during pandemic were analyzed in this study. It revealed an elevation of suicide by 61% during this pandemic based on the three months data of emergency call record and comparison with the same period of previous year. |
| 16 | Elhadi et al., 2021 [42] | Libya | 2430 | Cross-sectional | April-May, 2020 | Medical students | Online survey distributed by email and through the social media groups of medical students | This paper assessed psychological impact of civil war and COVID-19 among the medical students of Libya by generalized anxiety disorder 7-item (GAD-7) scale, and patient health questionnaire (PHQ-9). The study revealed that suicidal ideation was present in 22.7% (552) of medical students. However, no information is available regarding how the suicidal ideation was assessed. |
| 17 | Sahimi et al., 2021 [43] | Malaysia | 171 | Cross-sectional | March, 2020 | Health care workers aged between 18 and 60 years-old | Online survey (Google Form) | This study assessed the rate and associated factors related to suicidal ideation among healthcare workers in Malaysia by PHQ-9 and |

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|----|----------------------------|--------------|-----|-----------------|----------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | | | | | disseminated via email, social media platforms (e.g., WhatsApp, Twitter, etc.) | Health Anxiety Inventory. It revealed that 11.1% (19) of the health care workers had current suicidal ideation. Multivariable analysis identified predictors of suicidal ideations namely clinical depression and (subthreshold) depression. While service length of more than 10 years was identified as a protective factor for suicidal ideation. However, no information is available regarding how the suicidal ideation was assessed |
| 18 | Asim et al., 2021 [44] | Pakistan | 393 | Cross-sectional | June, 2020 | Adult females living in Karachi | Online survey distributed on social media platforms | This study assessed the status and socio-demographic factors that are associated with depression and anxiety among women in Karachi during COVID-19 Pandemic by PHQ-9 and GAD-7 scales. It revealed that 148 (37.7%) of women had self-destructive thoughts at one time or another |
| 19 | Karim et al., 2021 [45] | Qatar | 748 | Cross-sectional | Not available | Adults aged 18 or above who were located in quarantine cities | | The study performed a network analysis using data from a nationwide study assessing the prevalence of depression and anxiety symptoms among quarantined persons for COVID-19 in Qatar. The analysis revealed a strong positive correlation between thought of self-harm and COVID-19 status. |
| 20 | Alghamdi et al., 2021 [46] | Saudi Arabia | 280 | Cross-sectional | July, 2020-May, 2021 | General population with 18-30 years of age | Online survey by sending the questionnaire through the emails and WhatsApp | This observational study aimed to observe the psychological impacts in the community population during the COVID-19 pandemic in Saudi Arabia by using Adult DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure Questionnaire, and the Ask Suicide Questionnaire (ASQ). It revealed 6.52% (32) of participants had thought of killing themselves in the preceding week while 15 had attempted. |

It is important to consider that, it is challenging to comment on the study duration as some studies were conducted by extracting data from the retrospective online media reports. Among the contributions articles, a wide variation was noted in regards to the sample size as it ranged from 80 (Bangladesh) to 145510 (Kazakhstan) (Table 2). Eight (27.6%) [Bangladesh 5, Iran 1, Iraq 1, Pakistan 1] studies were conducted among the general population, six studies (20.7%) [Bangladesh 5, Libya 1 (medical students)] were conducted among the students, two studies (Bangladesh 1, Saudi Arabia 1) were conducted among the young adults, two studies (Iran 1, Malaysia 1) were conducted in health care professional including the nurse, one study was conducted among adult females in Pakistan and one study was conducted among quarantined persons in Qatar (Table 2). Data were collected through an online survey in twelve (41.4%) studies, from online media (newspaper and/or television) reports in twelve (41.4%) studies, by interview in only one study in Iran among 10,843 Iranian samples, from secondary data of the emergency call center of Kazakhstan in one study, and from census in one study from Iran (Table 2).

Two studies from Bangladesh used *Suicidal Behaviors Questionnaire-Revised* (SBQ-R) to assess suicidal behavior [27, 28]. Among them, one study didn't mention the distribution of suicidal behavior (idea, plan, and attempt) that makes the interpretation challenging [27]. The *Ask Suicide Questionnaire* (ASQ) was used in one study conducted in Saudi Arabia [46], the *Beck Scale for Suicidal Ideation* (BSSI) was utilized in one study conducted in Iran [38], single item of *Montgomery-Asberg Depression Rating Scale* was utilized in one study of Bangladesh [29], a single item of *Patient Health Questionnaire* (PHQ-9) was utilized in two studies in Iran [38] and Malaysia [43], no information was available regarding how the suicidal

ideation was assessed in two studies [43, 44] from Libya and Pakistan one each (Table 1).

Suicidal Behavior during COVID-19 in Muslim Majority Countries

Rate of Suicidal Behavior

The prevalence, risk factors of different suicidal behavior and impact of COVID-19 widely varies based on study methods, time, and country (Table 1). The prevalence varies from 5-48% in Bangladesh. The prevalence of self-destructive thoughts was 37.7% among adult females of Pakistan [44], 11.1% among health care workers in Malaysia [43], 22.7% among medical students of Libya, 20.8% among general population in Iran [38], 6.5% in Saudi Arabia [46], 6.1% and 5% (suicidal ideation) among general population [35, 37], 8.2% (suicidal behavior) among young adults [32], 37.5% [28], and 47.9% among adult university students of Bangladesh [27].

Identified Risk Factors from Media Reports

Case studies mentioned some speculated risk factors such as economic hardship due to COVID-19 pandemic and fear of infections [21, 25], COVID-19 and its containment measures [18, 24, 40], social stigma [18, 22, 24], financial hardship due to COVID-19 [20], family-related factors, marital disharmony, harassment, sexual violence, emotional breakdown, economic hardship, and stigma towards COVID-19 [29, 30].

Identified Risk Factors from Online Surveys and Others

Several risk factors were identified through online surveys namely presence of depression among healthcare workers in Malaysia [43], insomnia, fear of COVID-19, female gender, city dwellers, lower educational attainment, married persons in Iran [38], females, divorced, and persons without a child [37], young age, female sex, cigarette smoking, comorbid illness, a higher score on the *Fear COVID-19 Scale*, and

insomnia [35], a higher COVID-19 risk, fear of COVID-19 infection, and having depressive and anxiety [32], women gender, divorcee or widower, low educational attainment, financial hardship due to the COVID-19 pandemic, death of close persons from COVID-19, contact with COVID-19 case(s), and fear of COVID-19 infection [28].

Effects of COVID-19 Pandemic on Suicidal Behavior

It is challenging to identify the precise impact of COVID-19 pandemic without community based pre-and post-data. One study revealed 61% elevation of suicide related emergency calls reported by three months data of emergency call record and comparison with same period of previous year in Kazakhstan [41]. While another study mentioned death by hanging was higher during the lockdown period in Bangladesh extracted from newspaper reports [34]. One comparative study in Iran identified that secondary traumatic stress due to COVID-19 among nurses significantly increased the suicidal ideation [39]. A study among 3331 adult university students in Bangladesh revealed the prevalence of suicidal ideation was 12.8% which was 18% before the pandemic [36] indicating a reduction of suicidal behavior. However, no validated objective instrument was used and no information was available regarding how many of the past ideators persisted it during the COVID-19 pandemic. Another study of 13,654 general population in Bangladesh revealed 8% of the participants had suicidal ideation during pandemic which was 13.7% during pre-pandemic state [33] indicating a reduction of suicidal thoughts during the pandemic. However, no validated objective instrument was used and no information was available regarding how many of the past ideators persisted it during the COVID-19 pandemic. The study of Aunoy et al. (2021) revealed that 6.5% of the participants reported

suicidal behavior during the pandemic whilst 8.6% of the participants had prior history of suicidal behavior which could indicate a decrease during the pandemic [31]. A study conducted in Qatar among quarantined persons for COVID-19 revealed a strong positive correlation between thought of self-harm and COVID-19 status [43].

Quality Concerns of Studies Evidence on Suicide in Muslim Countries during COVID-19 Pandemic

Surprisingly, two LTEs from Bangladesh explicitly mentioned the personal identification of the cases like the newspaper and television reports [21, 22] and another LTE from Iran reported three unconfirmed suicides of physicians by extracting data media reports [23]. Simplistic mono-causal explanations have been noted in LTEs reported from Pakistan [25, 37], and Bangladesh [18, 20]. No objective and the validated instrument was used in five studies from Bangladesh while assessing suicidal behavior [18, 31, 35-37].

Discussion

Suicide is an under researched issue in the Muslim majority countries especially among the LMICs. The COVID-19 pandemic has affected almost every aspect of human life including suicidal behavior. We aimed to explore suicidal behavior and the extent of suicide research during the pandemic in Muslim-majority countries. We performed a search in several databases to identify articles that revealed 29 articles from 9 Muslim countries/territories. We couldn't find any article from the rest 40 (80.1%) Muslim countries/territories indicating that there is a lack of studies on suicidal behavior in 80% of the Muslim majority countries during COVID-19 pandemic. More than half of the included studies (n=16) were published from Bangladesh and at least one paper was published

from eight other countries. More than two-thirds (69%, n=20) of the retrieved papers were original contributions from nine countries; this is, perhaps, an indication of the widespread impact and research focus on suicide during the pandemic. Not surprisingly, most investigators either employed online survey methods or analyzed online media reports (82.7%, n=12) and only a few used interview methods. Probably, the periodic country wide lockdowns and physical restrictions imposed to contain the spread of the pandemic would have rendered paper pencil surveys difficult. The limitations of online surveys and media reports in terms of their representativeness are well documented [47-49]. A few studies used specific screening tools to assess suicidal behaviors; others either used the relevant suicide item from symptom rating measures for depression or did not use any objective measure which creates fundamental challenge to generalize the study findings and potential sources of biases.

There was wide variation in the rate of suicidal behavior both within and across countries, as well as population subgroups. A higher prevalence was noted among medical [42] and university students [27], adult women in Pakistan [44], and community-based studies from Iran [36] and Bangladesh [28]. The noted differences in prevalence rates can be explained by several factors such as variations in study instruments, type of suicidal behavior, and study population. Some studies assessed suicidal behavior without objective and validated instruments, some used single item questions of another construct, some used structured instruments, some studies assessed only suicidal ideation, whilst some assessed all the behaviors (i.e. suicidal ideation, plan, and attempt). Such differences can produce variations in outcome variables. The observed variations among the countries may also be attributed to

differences in socio-cultural, racial, and economic factors [50, 51].

Demographic risk factors for suicidal behavior during the pandemic were young age, female sex, having lower educational attainment, being married or divorced, and urban city dwellers. Though this information will assist in identifying a higher risk subgroup from population for selected prevention strategies such as regular screening, their utility in individual cases may be limited. Other risk factors were socioeconomic variables such as familial factors, marital disharmony, domestic violence, financial strife, stigma, and fear of infection. These factors are similar to what has been proposed by prior investigators, based on theoretical [54] as well as empirical investigations [56-58]. Coordinated multisectoral efforts that address the economic and mental health consequences of the pandemic, strengthen awareness and access to mental health care, train gatekeepers in identifying people at risk for suicide [56], and promote self-help strategies will be needed to address risk and prevent suicide [57- 58].

Few studies evaluated the impact of COVID-19 pandemic on suicidal behavior by comparing pre and post pandemic suicide rates. The results were inconsistent; some studies documented a rise in suicide rates post pandemic while discordant findings were also observed, though some studies in the latter group were limited by lack of objective measures for assessing suicide. Few countries have documented a decline in suicide rates during the initial months of the pandemic owing to reduced work hours, increased federal support, and closure of schools [8, 59]. However, the rates increased in the subsequent months due to the adverse socio-economic and mental health fall outs of the pandemic and its attendant restrictions. As it has been postulated earlier, these consequences are likely to outlast the pandemic; countries must prioritize

monitoring of real-time suicide data and mitigation of pandemic related risk factors for suicide through decisive action [60].

Interestingly, one study noted that hanging as a preferred mode of suicide increased in Bangladesh [34]. Such data on suicide trends was not available from other countries. More people may simply have chosen to die by hanging due to the difficulty in procuring chemical poisons or firearms during the pandemic restrictions. It is difficult to apply means restriction to hanging but curtailing availability of ligature points, particularly in hostel rooms of academic institutions and use of anti-suicide ceiling fans, a recent innovation [61], may be considered by the authorities; this is of especial significance given that university students were found to be a high-risk sub-group in the reviewed papers. Though it may appear to be a simplistic solution to student suicides, given that means restriction is an evidence-based method of suicide prevention, we are of the opinion that this suggestion may have added value, when implemented in conjunction with efforts aimed at student wellness promotion [62].

Quality Concerns of Studies Evidence on Suicide in Muslim Countries during COVID-19 Pandemic

During the pandemic, the submission rate of article was dramatically increased whilst review duration was reduced as journals and publishers were bringing the papers quickly that raises concerns regarding quality of articles and incidence of retractions being noted [63-64]. Our review also revealed that about 40% of papers used media reports to assess the suicidal behavior, two LTEs from Bangladesh explicitly mentioned the personal identification of the cases like the newspaper and television reports, and another LTE from Iran reported three unconfirmed suicides, simplistic mono-causal explanations have been noted in LTEs reported

from Pakistan and Bangladesh, no objective and validated instrument were used in five studies from Bangladesh while assessing suicidal behavior, single item of *Montgomery-Asberg Depression Rating Scale* was utilized in one study of Bangladesh, a single item of Patient Health Questionnaire (PHQ-9) was utilized in two studies in Iran and Malaysia, no information was available regarding how the suicidal ideation was assessed in two studies from Libya and Pakistan one each. The *International COVID-19 Suicide Prevention Research Collaboration (ICSPRC)* raised concerns regarding it demanding adequate attention from authors, editors, and publishers to this aspect [65].

Limitations of the Study

This review has several limitations. Firstly, we included the studies published only in the English language resulting in missing some evidence published in any vernacular language. However, the chance is again lower because the majority of LMICs have no journal in vernacular language. Secondly, the pandemic and its effect is still ongoing. Therefore, there are strong chances that further studies would come out.

Policy Recommendations

Based on the findings of this review, we recommend some policy level attention for this ongoing pandemic and targeting the future global pandemics like this one. International, regional, and local professional bodies and policy makers would encourage researchers to produce high quality evidence regarding this important issue in Muslim-majority countries. Additionally, it is also important to ensure the holistic participation of all regions and countries to identify any country/region specific risk and resilient factors.

Conclusion

The review identified an extreme dearth of high-quality research on suicidal behavior in Muslim countries during the COVID-19 pandemic to ascertain

the prevalence and risk factors of suicidal behavior. Additionally, it gives an inconclusive picture regarding the direction of impact of the pandemic behavior (i.e. increase or decrease) on suicidal behavior in Muslim-majority countries. Further high quality evidence is warranted among the countries to prevent deaths by suicide and sufferings from suicidal behavior during pandemics.

Conflict of Interest

The authors have declared no conflict of interest for this study.

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All authors have read and approved the final version of the manuscript. The corresponding author had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

Transparency Statement

The lead author S. M. Yasir Arafat affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any

discrepancies from the study as planned have been explained.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

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