Review

Facebook and Suicidal Behaviour: User Experiences of Suicide Notes, Live-streaming, Grieving and Preventive Strategies. A Scoping Review.

Sheikh Shoib [1]**, Miyuru Chandradasa** [2]**, Mahsa Nahidi** [3]**, Tan Weiling Amanda** [4]**, Sonia Khan** [5]**, Fahimeh Saeed** [6]**, Sarya Swed** [7]**, Marianna Mazza** [8]**, Marco Di Nicola** [9]**, Giovanni Martinotti** [10]**, Massimo Di Giannantonio** [10]**, Aishatu Yusha'u Armiya'u** [11] **and Domenico De Berardis** [12,*]

1. Department of Psychiatry, Jawahar Lal Nehru Memorial Hospital, Srinagar, Kashmir, India. Email: Sheikhshoib22@gmail.com
2. Department of Psychiatry, University of Kelaniya, Ragama, Sri Lanka. Email: miyuruc@kln.ac.lk
3. Psychiatry and Behavioral Sciences Research Center, Mashhad University of Medical Sciences, Mashhad, Iran. Email: mahsa.nahidi@gmail.com
4. Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore, Singapore. E-mail: wa.tan@u.nus.edu
5. Frontier Medical and dental college, Abbottabad, Pakistan. Email: Soniakhan205@gmail.com
6. Department of Psychiatry, Psychosis Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran. Email: Fa.saeed@uswr.ac.ir
7. Faculty of Medicine, Aleppo University, Aleppo, Syria Email: saryaswed1@gmail.com
8. Institute of Psychiatry and Psychology, Department of Geriatrics, Neuroscience and Orthopedics, Fondazione Policlinico Universitario A. Gemelli IRCCS, 00168 Rome, Italy. Email: mariannamazza@hotmail.com
9. Department of Psychiatry, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, 00168 Rome, Italy. Email: marcodinicola.md@gmail.com
10. Department of Neuroscience and Imaging, University "G. d'Annunzio", 66100 Chieti, Italy. Email: giovanni.martinotti@gmail.com; digiannantonio@unich.it
11. Department of psychiatry, College of Medical Sciences, Abubakar Tafawa Balewa University Bauchi state, Nigeria. Email: aarmiyau@gmail.com
12. Director, Department of Psychiatry, ASL 4, 64100 Teramo, Italy. Email: domenico.deberardis@aslteramo.it

* Correspondence: Corresponding: domenico.deberardis@aslteramo.it

Abstract: Background: Facebook represents a new dimension for global information sharing. Suicidal behaviours and attempts are growingly reported on Facebook. This scoping review explores the various aspects of suicidal behaviours associated with Facebook, discussing the challenges and preventive measures. **Methods:** PubMed, Google Scholar, and Scopus were searched for related articles published in English up to October 2021, using different combinations of "Facebook" and "suicide". A group of consultant psychiatrists screened the records and read the full-text articles to extract relevant data. **Results:** Facebook impacts suicidal behaviours in different aspects. Announcing suicides through sharing notes or personal information, which can be helpful in prediction of suicide, and harmful since negatively affects audience. Live-streaming videos of suicide is another aspect, which questions the ability of Facebook to monitor shared contents that can negatively affect the audience. Helping bereaved families to share feelings and seek support online, commemorating the lost person by sharing their photos is another positive impact. Moreover, it can provide real-world details of everyday user behaviours, which are helpful to predict suicide risk, primarily through novel machine-learning techniques, and provide early warning and valuable help to prevent it. It can also provide a timeline of the user's activities and state of mind before suicide. **Conclusions:** Social media can detect suicidal tendencies, provide support for those seeking help, comfort family and friends with their grief, and provide insights via timelining the users' activities leading to their suicide. The lack of quantitative studies on evaluating preventative efforts on Facebook was one of the limitations. The creators' commitment and the users' social responsibility will be required to create a mentally healthy Facebook environment.

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1. Introduction: Suicides and social media   53

Globally, 700,000 people die every year due to suicide, and 77% of these suicides oc-   54
cur in low and middle-income countries [1]. Suicides are frequently under-reported for   55
various societal, economic, and political reasons; therefore, the actual number of suicides   56
is believed to be significantly higher [2]. Various cases were documented wherein users   57
took to social media to announce or even broadcast their suicidal attempts [3].   58

Today, social media has become a mainstay of communication, and out of the diverse   59
options available, Facebook is the largest known platform with close to three billion users   60
[4]. Social media broadens the scope and content of human communication and allows for   61
free expression and selective representation of undesirable behaviour [5]. An emerging   62
trend noticed in the last few years is announcing suicide on Facebook.   It is observed that   63
young people who self-harm use the Internet frequently to express their distress, and   64
there is a rising trend of people committing suicide after posting on social media, which   65
is found to have assortative patterns [6]. Certain users post their intent publicly on social   66
media and then commit suicide, and multiple such cases have been reported [4].   67

According to studies, expressing suicidal intent via social media platforms might be   68
seen as an unconventional means of seeking help, and this has encouraged researchers to   69
look into harnessing the powers of social media to prevent suicides [7]. It has been ob-   70
served that users are keen to be helpful; however, they lack the knowledge required. Ef-   71
forts focused on empowering social media users, like forming rescue or support groups,   72
would make for a convivial and welcoming online world [8–10]. Prevention of suicides by   73
monitoring social media posts and analysing online behaviour would be possible [11].   74

Although the associations between suicidal behaviour and social media can be inves-   75
tigated in several psychosocial aspects, few studies have addressed this issue to consoli-   76
date the relevant evidence available in the literature. There is currently no report on the   77
percentage of Facebook-associated suicides that lead to death. The extent of detrimental   78
effects social media can have in this regard and their possible contributions to predicting   79
and preventing suicidal behaviours remain controversial. We explored suicidal behaviour   80
expressed through Facebook to understand the socio-cultural implications and the role of   81
the audience, and how one can prevent such events. Out of all the social media platforms,   82
we focused on Facebook as it has the largest number of followers and unique online cul-   83
ture [12,13].   84

2. Methods   85

We searched Google Scholar, Scopus, and PubMed up to October 2021 from the be-   86
ginning of data for articles related to announcing suicide on Facebook, live streaming su-   87
icidal behaviour, grieving suicide, and preventing suicides. The search strategy used on   88
PubMed was 'Facebook suicide [Title/Abstract]) OR (Facebook suicidal [Title/Abstract])   89
AND (English Language) and it yielded seventy-one initial results. On Google Scholar,   90
we used the search terms "Facebook suicide", leading to 246 article findings. We searched   91
article title, abstract, and keywords as "Facebook suicide" on Scopus, leading to 175 arti-   92
cles. As shown in Figure 1, a group of consultant psychiatrists went through all articles   93
and data were extracted from each original article. Only English-language studies were   94
included in the review. We also reviewed the reference lists of included articles for addi-   95
tional publications. Abstracts, unpublished research, reviews, and duplicates were ex-   96
cluded. All search results were perused on the relevance to the topics announcing suicide   97
on Facebook, live streaming suicidal behaviour, grieving suicide, and preventing suicides.   98
The articles not reporting data on the above themes were excluded after two consultant   99
psychiatrists had studied each one.   100
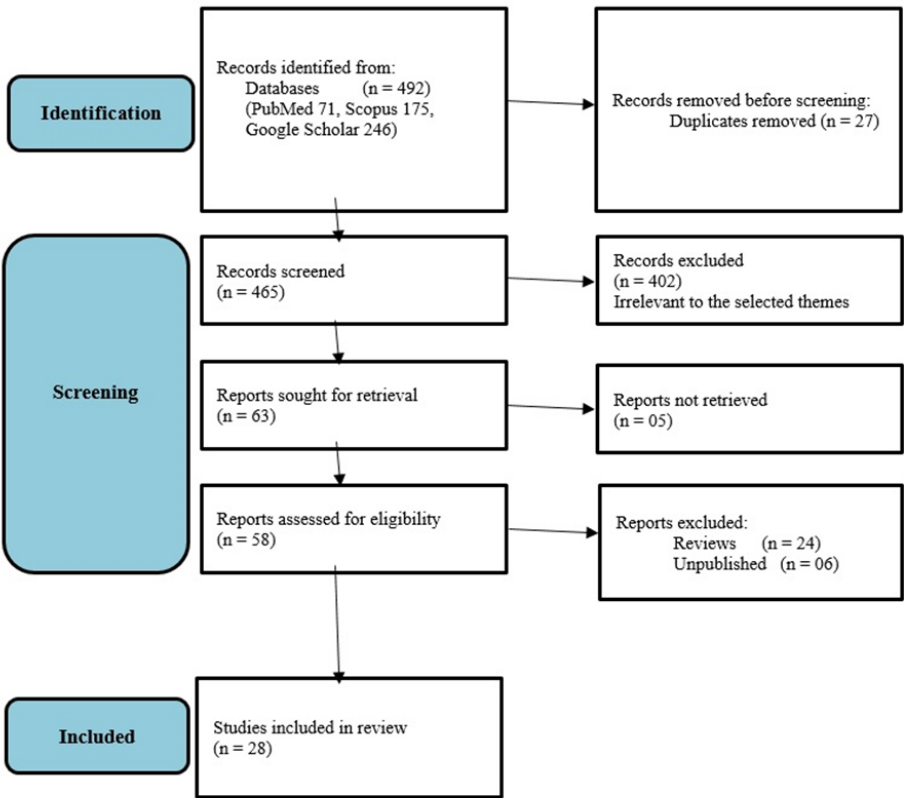
Figure 1. Publication selection process.

3. Results

We have summarised the significant findings of the most relevant studies that were retrieved by our search of the literature into four distinctive categories: announcement of suicide decision on Facebook (Table 1), video-streaming of the act of suicide on Facebook (Table 2), using Facebook for grieving after a suicide (Table 3), and Facebook for prevention of suicide (Table 4). Key points relevant to the topic and theme selected by the consultant psychiatrists are included in the tables. As indicated in Table 1, the announcement of suicide on Facebook can be made through sharing suicide notes, personal information, or preceding life events leading to suicide, which can be helpful in the prediction of suicide. Facebook also provides a large audience with whom the suicide behaviours can be shared, which can negatively affect.

Table 1. Announcing suicide on Facebook.

Authors	Study details	Report	Key points
Behera et al., 2020 [4]	Case presentation and discussion	A 32-year-old male who died by suicide was discovered hanging at his residence. The investigation found that he had uploaded a suicide note to Facebook. Images of the ligature and multiple messages regarding his intention were mentioned earlier on his account, and he had requested his online friends to support his family.	People share personal information more openly on Facebook. Posting about their suicide on social media gives the victim the chance to reach out to others without meeting or even knowing them. It may be possible for one of the Facebook contacts to offer support and intervene to prevent suicide.
Ahuja et al., 2014[14]	Clinical case discussion	A patient was hospitalised after making an impulsive suicide attempt, and social media was used to identify the events leading up to the attempt. This evidence helped the patient gain more insight and agree to participate actively in treatment.	The timeline of social media posts can speculate the events before a person's suicide attempt enabling identification of triggers. Social media platforms may be valuable in identifying and preventing suicide by screening users at considerable risk and providing online support.
Ruder et al., 2011 [3]	Case report	A case involving a suicide note on Facebook and discusses potential consequences.	Suicide notes on social media may help prevent suicide as other users could intervene and extend support. The extent of copycat suicides on Facebook is unclear.
Soron, 2019 [15]	Case report	A 25-year-old female died of suicide by hanging in Bangladesh. Numerous posts on her Facebook were evidence of her deteriorating mental state and her intent of suicide. Nevertheless, she was ridiculed and goaded by saying, "you should die", while others thought it was funny or frivolous.	There is increasing interest in finding how Facebook can be used for suicide prevention. For suicide prevention efforts to succeed, appropriate and active participation of users has to be ensured.
Barrett et al., 2016 [16]	Cross-sectional study	Among 1435 non-fatal self-harm cases, 44 left a social media suicide note, and 71 left a paper suicide note. Clinical notes of clients presenting with self-harm to two emergency departments were searched for mentions of social media use. Risk factors were compared to clients who used paper notes.	It was observed that leaving suicide notes on social media was associated with younger age, substance use, and repeated non-suicidal self-injury. On the other hand, leaving a paper note correlated with higher suicidal intent and risk.
Islam et al., 2021 [17]	Case series	In Bangladesh, nine cases that expressed their intent on Facebook were studied. A series of reports	Adolescents and young adults frequently share their suicidal thoughts on social media rather than with their families or mental

Authors	Study details	Report	Key points
		in which victims committed suicide after sharing their distressful thoughts and emotions on Facebook posts or live streaming. Most of the victims were adolescents and youth.	health professionals. Artificial intelligence and machine learning are recommended to screen potential suicidal content on social media.
Rossi & de Silva, 2020 [18]	Case report	A male patient presented to the emergency room after an intentional overdose following an altercation with his girlfriend. He had posted, "there is no coming back from this". There were thousands of views, with some viewers encouraging him, influencing his behaviour.	Social media provides a large audience and unrestricted reach for self-expression, encouraging people at risk of self-harm and suicide. The social media environment also normalises suicide and self-injury and may encourage competition between users to injure themselves more seriously.
Kailasam & Samuels., 2015[19]	Case presentation and discussion	In the USA, two cases were presented who left suicidal notes on Facebook before an attempt.	Social media could be recruited for early intervention. High tech monitoring methods should be administrated for high-risk patients

Table 2 summarises the data reported on cases in which Facebook shared live streaming videos of suicide online. The main concerns were the ability of Facebook to monitor the contents of these videos and how it can prevent their spread, which can negatively affect the audience. 116 117 118 119

Table 2. Live-streaming suicide on Facebook. 120

Authors	Study details	Report	Key points
Majeed et al., 2018 [20]	Case report	A 14-year-old male read out a suicide note and took a handful of pills in front of a live stream after a conflict with family. A viewer called the emergency services, resulting in a successful rescue. The teen later stated that he waited till he had as many viewers as possible before attempting suicide.	Artificial Intelligence is used to monitor online content for suicidal intentions. Despite this, people stream their suicide attempts live. Timely intervention and collaboration with local authorities are required to save lives.
Soron & Islam, 2020[21]	Cross-sectional study	In Bangladesh, 19 cases who died by suicide were studied, and this was an online search to find people who committed suicide after Facebook posts or live streamed suicide.	All were under 35-years of age, and a majority were male students. Hanging and poisoning were the most frequent methods. Facebook posts and live stream videos indicated relationship problems and academic stressors.

One of the major advantages of Facebook can be the means it provides for the grieving family members or friends, through which they can share feelings and get support from other users online, as well as commemorating the dead person by sharing their photos or posts (Table 3). 121 122 123 124

Table 3. Facebook and grieving suicide.   125

Authors	Study details	Report	Key points
Degroot & Leith, 2018 [22]	Qualitative study	About 3600 posts in a Facebook memorial group were analysed in the USA. In 2009, a memorial page was created on Facebook to mourn the suicide of a fictional character, Lawrence Kutner, from the sitcom House MD. Parasocial relationships and breakups were most of the content posted by fans.	Social media might be responsible for a blurred line between fiction and reality and present as an outlet for grief.
Feigelman et al., 2019 [23]	Cross-sectional study	In the USA, 1,432 adults in the general population were studied, and they investigated the correlates of suicide and bereavement.	Females experiencing bereavement were more likely to be Facebook subscribers, and target messages in this platform could offer psychological support.
Bailey et al., 2017 [24]	Cross-sectional study	In Australia, 222 suicide bereavement forums users were surveyed, and help-seeking behaviours, potential benefits, and limitations were studied.	More than 90% of the participants have sought face-to-face professional support. However, they preferred informal support provided by the online platform and were willing to continue this engagement.
Scourfield et al., 2020 [25]	Quantitative comparative study	A UK study using artificial intelligence to assess Facebook memorial notes related to 23 suicides and 29 road traffic accidents were conducted. Unique features of online memorials for youth suicides were explored and compared with memorials for road traffic accident deaths.	Memorial sites on Facebook contained more detailed posts and words suggesting causation and achievement. Compared to road traffic accident deaths, suicide memorial posts had more tentative words, non-fluencies, and question marks, suggesting that loved ones struggled to make sense of these losses.
Bell et al., 2015 [26]	Qualitative study	In the UK, eleven bereaved persons (20-60 years old) were analysed through interviews, and some individuals have created, maintained, and used Facebook sites to remember a loved one departed due to suicide.	For many, Facebook allowed the bereaved to memorialise their loved ones and feel their ongoing virtual presence. It positively affected their mental health, but it created tension with others dealing with grief differently.
Dilmac, 2018 [27]	Qualitative study	An analysis of Facebook accounts dedicated to Turkish martyrs described the new funeral rituals seen on the Internet.	With the virtual tombs, memorials, and death anniversaries, the virtual world allows families to accept the Turkish soldiers' deaths and choose to keep them 'alive' online.

Table 4 summarises the studies on another advantageous use of Facebook: suicide   126
prevention. There have been different suggestions and actions in this regard, such as arti-   127
ficial intelligence algorithms that can predict and help prevent suicides, online support   128

groups where people can share their distress, reduce the risk of suicide, and help other   129
users who commiserate with the person sharing their hardships and feelings.   130

Table 4. Facebook and suicide Prevention.   131

Authors	Study details	Report	Key points
Ophir et al., 2020 [28]	Cross-sectional study	Analysed 83,292 posts of 1002 authenticated Facebook users. Constructed Artificial Neural Network (ANN) models were used to screen suicide risk from everyday posts of social media users.	A multi-task model predicted suicide risk with higher accuracy by analysing Facebook posts than a single-task model. Tools can be developed to predict suicide risk among social media users by analysing their posts.
Robinson et al., 2021 [29]	Online cross-sectional survey	Reported an online survey (n = 48) and two workshops (n = 47) conducted. The adaptation of the #chatsafe guidelines in Australia to thirty-eight countries was studied.	Minimal adaptation was required to achieve a broader virtual international audience. It demonstrated the need for youth to feel better prepared about discussing suicide on an online forum.
Yeo, 2020 [30]	Qualitative narrative analysis	In Hong Kong, 136 anonymous personal Facebook stories of students on self-harm behaviours or suicidal thoughts, revealing hidden grievances and struggles, were analysed.	Users on social media platforms can post about their distress anonymously, giving them a buffer from the invalidation they face in real life, which will reduce the communication gap and interpersonal communication breakdowns.
Teo et al., 2020 [31]	Qualitative study	In the USA, thirty veterans were recruited through Facebook, and semi-structured interviews were held on responding to friends' emotional distress on social media and potential interventions.	Many veterans showed hesitancy when posting about their troubles on Facebook but were willing to reach out to help other peers. Training veterans in suicide prevention could prove vital to their competence in responding to these distressing posts.
Robinson et al., 2015 [32]	Qualitative study	In Australia, ten researchers, 13 organisations and 64 users were consulted on the nature and risks related to Facebook use.	Social media provides users with an opportunity to talk to others with similar issues to provide emotional support. The benefits of social media suicide prevention initiatives far outweigh any risk associated.
Haines-Delmont et al., 2020 [33]	Cross-sectional study	They applied machine learning in an acute mental health setting in the USA for suicide risk prediction through a smartphone app linked to Facebook and other platforms. It collected information	An algorithm to assess suicide risk in inpatients can be created to provide crisis response to users who are hesitant to seek immediate help. This could be fully automated and independent of clinical

		about sleep, mood, step frequency, count, and engagement patterns with the phone.	judgement, but the legal and ethical implications need to be considered.
Sumner et al., 2020 [34]	Analytical cross-sectional study	The study analysed 664 suicide-related articles on Facebook and adherence to suicide-reporting guidelines.	Assessment of Facebook data revealed that harmful components were frequently seen in news articles about suicide while protective elements were rare. Closer adherence to safe-reporting practices was associated with more shares.
Nathan & Nathan, 2020 [35]	Cross-sectional study	In the USA, a brief survey on the perception of suicide on social media platforms was done, and 152 responded. The study assessed the perception of participants on suicide-related material on Facebook and associated factors such as gender.	A majority believed suicide was preventable and stated that the media glorified suicide. The females reported finding support on social media while the males did not. Many did not believe suicide was stigmatised.
Lee et al., 2020 [36]	Cross-sectional study	In Australia, 7487 adults completed a survey on suicide literacy, stigma, risk and participants were recruited via Facebook advertisements.	Facebook demonstrated efficacy and cost-efficiency in recruiting for a suicide prevention community. More extensive research is needed to make this sample more representative.
Brailovskaia, et al., 2020 [37]	Cross-sectional study	An investigation of the possible mediating role of Positive Mental Health (PMH) for the relationship between Facebook addiction disorder and suicide-related outcomes among 209 cases from Germany was conducted.	The addictive Facebook use is related to suicide outcomes. PMH reduces this risk. It is recommended to consider addictive Facebook use and PMH in suicide risk assessment.
Tao & Jacobs, 2019 [38]	Secondary analysis	The study utilised an existing data set of Facebook commentary, and there were 445 comments made on 156 anonymous posts.	Most of the participants support those sharing their experiences about depression and suicide. Therefore, Social communication anonymously on social media can provide psychological support
Rashid Soron, T, 2019 [15]	Opinion article	The use of Facebook has increased in Bangladesh and has focused on preventing suicides.	Facebook could be used for developing a suicide database in Bangladesh and would be helpful in future policymaking. Ethical issues should be considered.

4. Discussion

Suicide is a leading cause of death worldwide, and early detection of risk and prevention should be a global mission [1]. Social media has attained a vital role in our world with increasing users. We explored the association between suicidal behaviour with Facebook and focused on four areas: announcing suicide, live streaming, grieving suicide, and prevention strategies.

More people sharing personal information openly on Facebook allows them a chance to reach out to others even without knowing them. In emotionally distressful situations, it may be possible to offer support and prevent a potential suicide [21]. Through analysing public posts and suicidal notes, social media platforms should identify users at an elevated risk and provide online support [3,4,14]. Suicide notes found on Facebook were associated with younger age, psychoactive substance use, and previous non-suicidal self-injury in the individual [16]. Further, young people could express and share their suicidal thoughts on social media more conveniently than with their families or professionals [17]. An unrestricted reach for self-expression was provided by Facebook and encouraged people in distress to normalise self-harming behaviour, and some even competed with others to injure themselves more seriously [18]. Apart from the opportunity to express their distress, repetitive negative thinking, which is likely to be present in many in emotional distress, and addictive Facebook use are associated with suicide ideation and suicidal behaviour. This may have led to a social-emotional environment invigorating potential harm directed to self [37].

Few studies have investigated the links between social media use, personality disorders, and traits [39,40]. For example, more Facebook friends has been associated with mania, histrionic, and narcissistic personality disorder symptoms, while fewer friends are linked to dysthymia and schizoid personality disorder. Facebook users, compared to non-users were reportedly having higher levels of self-esteem and narcissism. These findings can indeed underscore the important impacts of personality disorders and their traits on suicidal behaviours via social media.

People stream their suicide attempts live, and timely interventions with the support of the regional mental health teams are required to save lives [20]. At times, loved ones are left helpless by such incidents, and some have taken legal action against the social media platform [41]. Persons who live-streamed suicidal behaviour mainly were under 35-years of age, and a majority were male students resorting to hanging and poisoning to harm themselves [21]. The victims had experienced relationship conflicts and academic stressors, as seen by their most recent posts before harm, and it has been shown that stress-management interventions through Facebook are beneficial for young people [42].

Memorial pages on Facebook have given a platform for loved ones to mourn the loss of a family member or even a fictional character due to suicide [22]. These pages contained long detailed posts by loved ones and words suggesting they struggled with their losses [25]. Women experiencing a loss and grieving were more likely to be Facebook subscribers, and mental health messages would be able to offer psychological support [43]. Further, research shows that many individuals use Internet forums and Facebook groups to grieve losses and find emotional support [24]. Despite a lot seeking face-to-face professional support, they preferred informal support provided by online platforms like Facebook. For many, Facebook allowed the bereaved person to memorialise their loved ones and feel their ongoing virtual presence (19,20). Individuals post on Facebook about their loss and grief to commemorate the deceased loved ones, mourn, and remember their special occasions allowing them to vent their distress in a virtual environment [45].

Multi-task artificial neural network models analysing Facebook posts could predict suicide risk better than a single-task model [28]. This will facilitate building tools to predict suicide risk among users correctly and has successfully dealt with crises in inpatient settings [33]. Users on Facebook can anonymously post their distress, leading to minimal suppression of emotional expression and preventing interpersonal communication breakdowns [30,31]. Social media such as Facebook provides an opportunity to talk to others and provide emotional support. There are substantial benefits of social media in suicide prevention [32]. However, Facebook needs to adhere to suicide-reporting guidelines as harmful content is frequently seen and should prevent the glorification of suicidal deaths [34,35]. For the future, Facebook has demonstrated efficacy and cost-efficiency in recruiting people for suicide prevention activities and could be used to develop far-reaching strategies [36]. Newer technologies such as artificial intelligence and machine learning

will play a core role in future preventive strategies, and finding the correct balance between safety and ethics would be a significant challenge [46]. Facebook indeed has an algorithm to detect and prevent suicide in action and to achieve this, machine learning classifiers need to be built, and many examples are fed to the system [47]. Various combinations of words impact the classifier's confidence, and it scores the content based on previously confirmed cases of suicidal expression. The classifier scores are inserted into a random forest learning algorithm, a type of machine learning that specialises in numerical data [47].

Our scoping review showed both positive and negative effects of Facebook on suicidal behaviour. It provided an audience to express distress and live stream harmful behaviour. On the other hand, Facebook allowed loved ones to mourn virtually and share their grief with others. Further, limited studies show that Facebook could provide opportunities to prevent suicides and function as a protective agent. As limitations, there were only a few quantitative studies to analyse, and it was challenging to come to broader conclusions. Also, the found studies were heterogeneous in methodology and approach. Most data were qualitative, and establishing causal relationships between Facebook use and suicidal behaviour is difficult. Creating a psychologically healthy Facebook experience will depend on the developers' commitment and the users' social responsibility, and further longitudinal quantitative studies are required to investigate the association between Facebook use and suicidal risk. Lastly, we did not investigate other factors influencing Facebook suicide.

5. Future Clinical Implications

Whether the suicide prevention algorithm of Facebook and other social media can show adequate efficiency to reduce the rate of suicides is an issue that requires further evaluation in large-scale, well-designed studies [48]. The possible association between the excessive use of social media networks and a higher risk of suicidal behaviours remains controversial and needs to be delved into further. As stated in previous studies, extensive use of social media as an addictive behaviour can increase the likelihood of suicidal behaviours through interactions with specific users, social groups, or online communities [49]. This is especially of cardinal importance in adolescents and young adults, in which imitative suicide is a major mechanism.

One important matter that deserves close attention from clinicians and the social media regulators and policymaking authorities is the ethical and moral issues that may arise when breaching the privacy of social media users by looking into and analysing their details. This may be indeed necessary for specialists who try to help the user and prevent the act of suicide [48].

6. Recommendations

- We recommend that future studies focus on real-world data and algorithms that provide insight into self-harm risk based on social media information. Moreover, further studies are required to shed light on the possible link between the addictive use of social media and suicidal behaviours.

- State authorities and policymakers are recommended to enforce strict data sharing regulations so that users' personal information and privacy are not affected. Artificial intelligence methods should anonymise the necessary information and provide valuable information to therapists.

- Advertisement campaigns regarding suicide prevention on Facebook can promote using hotlines and mobile applications, providing dependable and practical support for people in distress.

- Facebook can also be efficiently used to increase the general population's awareness regarding mental health issues and educate the communities to prevent stigmatisation of mental illnesses. This can reduce the rate of suicidal behaviours and acts of suicide in the long term.
- An option for being under surveillance for suicidal risk should be extended to all users.
- All social media platforms, including Facebook, should use techniques for users to report harmful websites and activities of other users.
- Direct and quick ways to get psychological support via Facebook should be available.
- Public health initiatives should target Facebook to promote awareness of psychological problems in schools, colleges, and other settings.
- Those in charge of suicide prevention and public health outreach efforts must keep up with Facebook trends, user preferences, and relevant legal issues.
- Finally, using Facebook to raise public awareness and education about mental health issues is a sensible modern public health strategy to save lives.

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