Review

Healthcare Students' Knowledge of and Attitude Toward Suicide: A Scoping Review

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Review

Healthcare Students' Knowledge of and Attitude Toward Suicide: A Scoping Review

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Abstract: Future healthcare professionals can play a significant role in managing those with thoughts of suicide. This scoping review aims to determine healthcare students' knowledge and attitude towards suicide. A systematic search was conducted across five databases: PubMed; CINAHL; EMBASE; PsycINFO; Cochrane; and DARE. Only primary studies written in English; from database inception until 31st December 2023 were included. A total of 44 studies were included. Overall; healthcare students demonstrated low to moderate confidence in managing patients with thoughts of suicide and low levels of relevant education despite acknowledging their importance in preventing suicide. Increased personal exposure to suicide was associated with increased suicide literacy; confidence in managing patients with thoughts of suicide, and reduced stigma. Demographics and culture were shown to affect knowledge and attitude as well. Further research is needed to better understand various contributing factors to healthcare students' knowledge and attitude regarding suicide. Evaluating healthcare curricula should be considered to implement effective suicide training program

Keywords: suicide; healthcare; students; attitudes; training

1. Introduction

According to the World Health Organisation (WHO), suicide has led to the death of 703 000 people globally every year [1]. It was found to be the fourth cause of mortality among 15-30 year-olds and 77% of suicide was reported to occur in low and middle income countries [1]. Due to stigma, legal, and cultural factors, deaths due to suicide are likely underreported and thus the actual prevalence of suicide might be underestimated[2]. Suicide attempts may results in emotional, physical, and economical consequences in individuals and their loved ones [3]. A systemic review reported that suicide-bereaved individuals experience more rejection, stigma, blame, and shame compared to other bereaved groups [4]. In addition, the economic impact of suicide is estimated to be $5.53 billion annually [5]. Given suicide's public health significance and its preventable nature, the WHO has identified suicide as a serious public health concern [6] and published a report in 2014 to further boost public health awareness around it [7].

Healthcare providers play a crucial role in identifying and preventing suicide. It was found that 44% of individuals visited their physicians a month before they completed suicide [8], however, only 3% of them had their complaints diagnosed as a mental health issue [9]. Indeed, patients reported they had received inappropriate and depersonalized responses with minimal empathy when they talked about suicide [10]. Meanwhile, the management of persons with thoughts of suicide is often impeded by legal, knowledge, emotional, communication, and logistic difficulties [11-13]. As a result, clinicians often hold attitudes of avoidance when dealing with suicide attempters, which has led to low-quality, superficial, and inadequate care [14,15]. In addition, a scoping review reported that pharmacists' role in suicide prevention was affected by barriers, either personal e.g. lack of confidence, training, knowledge; or institutional e.g. work pressure, lack of time or privacy,

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nonavailability of resources and referral pathways [16]. This has then resulted in persons with thoughts of suicide often refusing to express themselves or seek help from available resources [10].

Based on the assumption that the behaviour of a person is based on their attitude [17], it is important to assess the attitudes of future healthcare providers. Studies indicate that primary care and community pharmacies are the most visited services by individuals prior to suicide, thus it gives these professionals the opportunity to identify individuals with suicidal ideation or those having a mental health crisis [18,19]. Besides, knowledge of suicide should be evaluated as well to ensure continuous systemic improvement in suicide management and health equity [20]. Future healthcare educational curricula that better fulfil public health need could be designed [21] to respond to the WHO's call to reduce suicide rate by one third by the year 2030 [1]. This scoping review aims to summarize data from the available literature to provide an overview of healthcare students' knowledge of and attitudes towards suicide and identify gaps as well as interventions needed.

2. Materials and Methods

2.1. Data Sources and Search Strategies

This scoping review followed the methodology outlined by Arksey and O'Malley [22]. Reporting for this review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement for Scoping Reviews (PRISMA-ScR)[23] ((Supplementary Table S1).

Search terms related to "healthcare students", "knowledge and attitude", and "suicide" were developed based on the study objectives and a review of the literature, and then further refined after a discussion with the university librarian, as well as among the researchers. Based on the finalized list, a systematic search was performed in the following databases: PubMed, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medica dataBASE (EMBASE), PsycINFO, and Database of Abstracts of Review of Effects (DARE). The full search strategy is listed in Appendix A. Only primary studies written in English from database inception until 31st December 2023 were included in our review. A manual search was undertaken to identify additional studies from references cited in retrieved articles and a free-hand search was also undertaken via Google Scholar.

All articles obtained from the search were imported into EndNote 20 before being uploaded to Covidence for further screening. After removal of duplicates, two researchers screened the title and abstract of the studies independently (Level 1 screening). The full texts of articles deemed possibly suitable based on the inclusion and exclusion criteria were then reviewed independently by the two researchers (Level 2 screening). Any conflicts that arose were resolved by discussion among the screening researchers, and where consensus could not be reached, the lead researcher (SAJ) was consulted. Ethical approval was not needed for this study as it did not involve human subjects.

2.2. Study Selection

Studies that evaluated the attitude and/ or knowledge of suicide of healthcare students from programmes such as medicine, nursing, pharmacists, dentistry, and allied health such as paramedics, oral health therapists, and dental therapists, were included. The following were excluded: (i) studies that involved healthcare students who had special training in psychiatry such as psychiatric trainees, psychology students, mental health nurses, and midwives, (ii) studies that only evaluated healthcare students' suicide rate and suicidality, (iii) studies that evaluated healthcare students' attitude and/ or knowledge on physician-assisted suicide, (iv) studies with outcomes that were not specific, such as the attitudes towards both depression and suicide, (v) in studies where evaluation of an intervention was the focus, pre-test attitudes or knowledge assessments were unavailable, (vi) reviews, systematic reviews, meta-analyses, conference abstracts, conference proceedings, in vivo studies, in vitro studies, animal studies, thesis, and letter to editors, (vii) studies that were not in English, and (viii) studies where abstracts and full texts were not available.

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2.3. Data Extraction

Two researchers developed a data extraction sheet specific for the review that included the following details: (1) author, year of publication and the country where the study was conducted, (2) study characteristics including objectives, method, sample size, and study instruments, (3) population demographics including gender, age, study programs undertaken and year of study, (4) outcomes including knowledge and attitudes, and (5) personal experience of suicide and mental health issues. The sheet was pilot tested by two researchers on two articles that were to be included in the scoping review. Further changes were made as appropriate to produce the finalized version. Two researchers then independently undertook the data extraction.

2.4. Data Analysis

Thematic narrative analysis was performed guided by Braun and Clarke [24] to develop themes from the included papers. Results were presented in tabular format and common themes were identified.

3. Results

3.1. Study Search

The database search yielded 1804 articles, while the manual search of the reference lists of potentially relevant articles yielded 10 additional studies as in Figure 1. After exclusion of duplicates and Level 1 screening, 46 articles were included for final analysis where 29 were excluded for the following reasons: did not involve healthcare students or no data specific to healthcare students available (n=11), involved healthcare students trained in mental health (n=6), full texts not available (n=4), studies evaluated post-educational programme findings of interest without pre-programme findings reported (n=5), study involved physician-assisted suicide (n=1) or was not related to suicide (n=1), and one study had no separation of results between depression and suicide. Characteristics of the included studies are detailed in Table 1.

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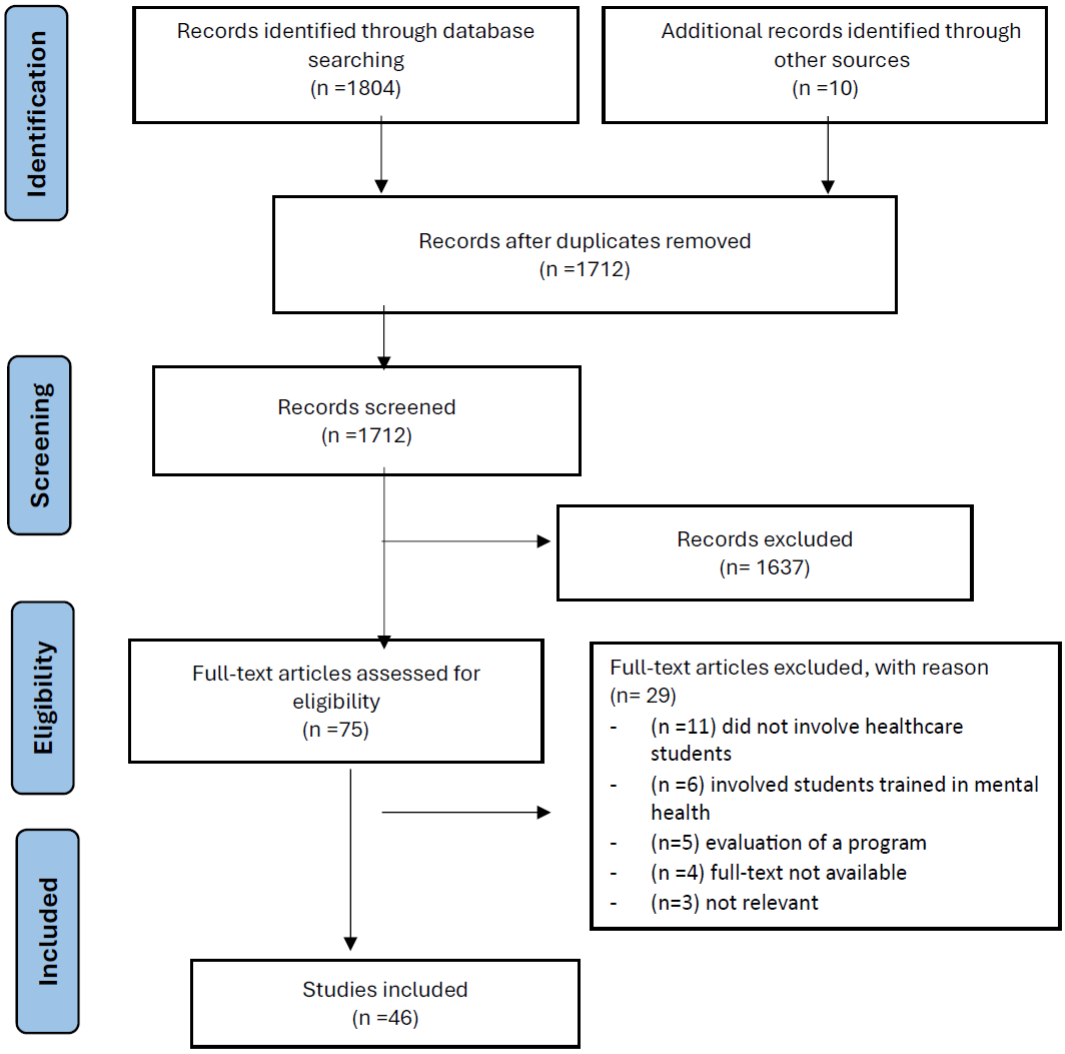

Figure 1: PRISMA-ScR flow chart of the study selection process.

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Table 1. Summary of included studies.

Author (year); country[a]	Objectives	Study design and instruments	N; Health programs[z]	Year of study[z]	Population characteristics (mean age; gender) [z]	Personal experience of mental health issues and suicide[z]	Outcomes	
							Knowledge[z]	Attitude[z]
Amiri et al. (2013); UAE [25]	• Prevalence of suicidal ideation, attempts • Attitudes toward suicide, hypothetical suicidal friend • Gender, mood, religiosity related differences	• Self-report survey[b] [26]	115; Medical	• 90% Years 1-4 • 10% Year 5-6	20.7y; 51.9% female	• 7% suicidal ideation in past 1 year • 1.8% suicidal ideation, a lifetime suicide attempt, and a suicide attempt in the past 1 year • Mean self-rated current mood level[ε]: 2.5 (minimal sadness) • Women more sadness than men (p =0.013)	NA	• High social acceptance, 4.26 (p=.027) • High desire to help a suicidal friend, 4.08 (p= .012) • Disapproving towards suicide • Strong belief in punishment after death • Women higher readiness to help (p=.012), more social acceptability (p=.027) • Sadness associated with higher suicide acceptability, less beliefs in punishment after death. • Religiosity associated with less suicide acceptability, seeing suicide as mental illness, parental communicating problems, greater social support
Ferrara et al. (2022); Italy [27]	• Attitudes towards suicidal risk • Impact of education intervention	• Cross-sectional survey: SBAQ-ita scale[c]	409; Nursing	• 41.7% Year 1 • 29.9% Year 2 • 28.3% Year 3	22y; 63.1% female	• 42% knew relatives/ friends with lifetime suicidal ideation • 9.2% have lifetime suicidal ideation • 11.5% ever suffered from mental disorder	• D2, 3: Low professional ability • D4, 5: Moderate knowledge, more among those with lifetime suicidal ideation (p =0.020)	• D1, 3.5: Strong concern on patient especially those who knew relatives/friends with lifetime suicidal ideation (p=0.01), has lifetime suicidal ideation (p = 0.029), has mental disorder (p = 0.025) • D3, 5: neutral on right to suicide
Giacchero Vedana et al. (2019); Brazil [28]	• Attitudes to suicidal behavior, and associated factors	• Cross-sectional questionnaire with SBAQ[d] [29]	111; Nursing	• Final	22.6y; 86.5% female	• 65.8% had previous contact with someone at risk of suicide • Suicidal thoughts throughout life 2.4: minimal[ã]	• 34.2% attended suicide prevention classes • 27.9% participated in relevant events • 22.5% read relevant material • Factor 2 12.5: Slightly low	• Factor 1, 9.3: Low negative feelings • Factor 3, 16.7: Neutral to rights to suicide • 61.2% associated suicide with mental distress, despair • Most negative attitudes associated with female (p= 0.001), lack of suicide prevention materials (p=0.033), low self-perception of professional competence (p<0.001)

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							self-confidence in dealing with suicidal persons	• Lifetime suicidal ideation associated with less moralistic/ condemnatory attitudes (p= 0.040)
Kavalidou et al. (2013); Greece [30]	• Attitudes towards suicide	• Self-reported SOQ[e] [31]	105; Medical	• Year 4,5 & 6	22.4y, 61.0% female	• 8.6% had suicidal thoughts • 6.8% self-reported >50% chance of suicide • 3.8% had previous attempts • 21.9% knew suicide victims • 13% had family members & relatives died by suicide • 13.0% had close friend died by suicide • 73.9% had acquaintances died by suicide	NA	• Strongly agree suicide as mental illness: 44.51, suicide threats cry for help: 40.21, suicide is morally bad: 11.03 • Agree no right to take own life: 16.81, suicide is abnormal: 16.97 • Males tends to think suicide was "morally bad": 11.975
Kelly et al. (2023); UK [32]	• Attitudes to suicide ideation • Previous suicide awareness training • Potential barriers to future training	• Online questionnaire [33]	30; Dental	• Year 3, 4 & 5	NA; 67% female	NA	• 10% has previous awareness training • 1 used their training • 80% not know what to do with suicidal thoughts/ disclosure • 50% agreed/ strongly agreed feeling uncomfortable assessing suicide risk	• 97% wished for further training • 97% agreed prevention was their responsibility • 63% agreed suicide were preventable • 50% disagreed/ strongly disagreed suicide is unpredictable
Krueger (1979); US [34]	• Manner and method of working with students when a patient commits suicide	• Interview in group	6; Medical	NA	NA; NA	NA	• Doubted self-competence	• Thought suicide is inevitable • Wondered about suicide's predictability • Expressed grief and concerns about the patient and others

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								• Try to identify patients' depression and suicidal potential, seek help if needed • Expressed guilt and hostility to the deceased
Lappann Botti et al. (2015); Brazil [35]	• Attitudes to suicidal behavior before and after a training course	• Cross-sectional survey: QABSB[f]	58; Nursing	• 43.1% 1st-5th term • 56.9% 5th-9th term	21-25y; 89.7% female	NA	Factor 2 by item: 1.2: low confidence in dealing with suicidal person	• Factor 1 by item: 3.7: low negative feelings • Factor 3 by item: 0.8: minimal "moralist attitude"
López-Narváez et al. (2020); Mexico [36]	• Attitude toward suicide prevention	• Semi-structured questionnaire containing ATSP[g] scale	355; Medical, nursing	NA	20.47y; 61.4% female	• 11%: personal history of suicide • 12.7%: family history of suicide (7.9% nursing and 16.8% medical students)	NA	• Nursing students: most negative attitude (p= 0.001) • Most negative attitude: Medicine students (2 items), nursing students (8 items) • "Suicide prevention are a drain on resources": disagree, most positive attitude in both groups • Those with personal history of suicide: most negative for rights to take own lives (p= 0.004) • Those with family history of suicide: less negative to unpredictability of suicide (p= 0.01)
Marques Moraes et al. (2016); Brazil [37]	• Attitudes and associated factors related to suicide	• Cross-sectional survey with SBAQ[d] [29]	244; Nursing	• 39.8% 3rd year • 38.9% 4th year • 20.5% 5th year	42.2% 21.0-22.9y; 86.5% female	• 61.9% had contact with someone who attempted suicide	• Factor 2: 12.2: Low confidence in dealing with suicidal persons , more in male (p = 0.00), those completed psychiatric nursing course (p=0.01), those participated in a class/laboratory on suicide (p=0.03).	• Factor 1: 9.0: Low negative feelings, women more negative feelings (p=0.01) • Factor 3: 17.0: Neutral attitude, those with bachelor's & licentiate's degree (p=0.03), those who read specific material on suicide (p = 0.01), less condemnatory
Öz et al. (2022); Turkey [38]	• Levels of stigma	• Cross-sectional survey with SOSS[h] [39], DAP-R[i] [40]	560; Nursing	• 24.8% 1st year • 28.4% 2nd year	19.3y; 63.7% female	• 24.6% have acquaintance who died from suicide	NA	• SOSS: neutral stigma (3.37), disagree suicidal persons struggling with isolation/ depression (2.21), strongly disagree to glorify suicide (1.27)

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	• Attitudes toward suicide attempters			• 22.7% 3rd year • 24.1% 4th year				• Stigma increased with age ($p < 0.05$) • Female, students with loss experience ($p < 0.05$) more agree with isolation/ depression among suicidal persons • Those having acquaintance who attempted suicide more stigma ($p < 0.05$) • Stigma decreased with increase in positive attitude toward death ($p < 0.05$)
Poreddi et al. (2021); India [41]	• Attitudes towards suicide, role in suicide prevention	• Cross-sectional survey with Suicide Attitude questionnaire[j] [42]	223; Nursing	• All years	19.8y; 89.7% female	• 5.8% & 1.8% students <20 years has suicidal ideation and attempted suicide • 6.3% has family history of suicide	NA	• Themselves having important professional role, work, care: 33.08 • Less moralistic attitude: 20.80 • Agree suicide to communicate and seek attention: 13.60 • Overall score 103.04: 68.7% have an overall positive attitude • >21y had positive attitudes in 'Acceptability of suicidal behaviors' ($p < 0.001$), 'Morality and mental illness' ($p < 0.001$), 'Professional role, work and care' ($p < 0.009$), 'Communication and attention' ($p < 0.02$), 'Beliefs' ($p < 0.001$) domains • Those who completed theory and clinical hours in mental health nursing has positive attitude in 'Acceptability of suicidal behaviors' ($p < 0.001$), 'Morality and mental illness' ($p < 0.001$), 'Professional role, work and care' ($p < 0.05$), 'Beliefs' ($p < 0.001$) domains
Vedana et al. (2018); Brazil [43]	• Meaning behind suicide	• Individual, open, semi-structured interviews	30; Nursing	• More than 5th semester	87% <25y; 87% female	NA	NA	• Multiple perspectives on preventability of suicide, some lack of comprehension, preparation • Suicidal behavior: Cry for help, desire to die, manipulation, death • Some distancing, avoid talking about suicide
Arafat et al. (2022); Bangladesh [44]	• Adapt, validate literacy of suicide scale, stigma of suicide scale into Bangla	• Questionnaire LOSS-B[k], SOSS-B[l]	162; Medical	NA	18-27y; NA	NA	• Mean LOSS score 4.57 (p= 0.018): very low • 56.7% very low literacy,	• High stigma to suicide: 15.1 • Agree suicide due to isolation/ depression: 13.6 • Neutral glorification of suicide: 8.8

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	• Determine level of suicide literacy and stigma toward suicide in Bangladesh						43.3% moderate literacy • 1.89% scored correctly in cause/ nature (lowest out of all aspects) • 77.1% scored correctly in treatment/ prevention (highest out of all aspects) • Suicide literacy higher in female (p=.007), those with history of suicide attempts (p= .020), family history of suicide attempt (p= .036)	• Stigma lower among female (p= .004), those with a history of past attempts (p= .046) • Those with history of suicidal attempt more likely to glorify suicide (p=.029)
Bajracharya et al. (2020); Nepal [45]	• Perception towards attempted suicide and association with selected variables	• Cross-sectional survey with SOQ[m]	103; Nursing	• 58.5% Bachelor level nursing • 41.5% Certificate level nursing	19.8y; NA	• 10.4% has family history of suicide	NA	• Neutral permissiveness (9.18) • Agree no right to prevent (7.93) • Those who did not attend courses on psychiatry nursing more negative attitude, association with permissiveness (p= 0.012), unpredictability (p= 0.017) and incomprehensible (p= 0.021) • Younger age more likely agree suicide is incomprehensible (p=0.046) • Younger age (p= 0.039), did not read relevant materials (p= 0.017) had more negative perception on duration of suicide process
Chan et al. (2014); Australia [46]	• Levels of stigma and literacy comparing to general university staff and students • Impact of stigma and literacy	• Cross-sectional survey with SOSS[h] [39], LOSS [47] and General Help-Seeking Questionnaire[o] [48]	219; Medical	Postgraduate: • 27% first year • 32% second year • 20% third year	24.6y; 53.8% female	NA	• LOSS scale: Moderate suicide literacy (17.5) among postgraduate, high literacy (20.4) among	• Postgraduate more likely normalize suicide (p=0.004) • Stronger descriptors ('evil') least endorsed • Prior exposure (p= 0.019), native English speakers (p= 0.035) more stigma

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	on low help seeking behavior			• 20% in fourth year Undergraduate: • All final year			undergraduate (p<0.001) • Medical students who attributed suicidal ideation to isolation and depression (p= 0.007), fourth years (p<0.001), undergraduates (p<0.001), native English speakers (p<0.001), have higher literacy	• Postgraduate (p= 0.029), those scored higher on LOSS (p= 0.007) more strongly attributed suicide to isolation, depression • Generally, low stigma, more likely to attribute suicide to depression/ isolation, less likely to glorify/ normalize suicide
Cryer et al. (2020); Australia [49]	• Compare personal stigma of suicide with that of other health conditions	• Online survey containing adapted SOSS$_P$ [39]	116; Medical	• 32% first year • 38% second year • 17% third year • 12% fourth year • 1% fifth year	25.02y; 58% female	NA	NA	• Low-moderate stigma • Second highest stigma, more stigmatized than depression (p < .001), breast cancer (p < .001) • Neutral levels of glorification/normalization • Least glorified, less than depression (p < .01), breast and lung cancer (p < .001), HIV (p < .001) • Low to moderate controllability • Middle of the controllability rankings, more controllable than breast cancer (p < .01), less than lung cancer (p < .001), HIV (p < .001) • Least disclosed except to friends, minister/religious leader • 33% (highest compared to other diseases) would tell no one
Hamaoka et al. (2007); US [50]	• Responses to inpatient suicide • Observations, suggestions to improve future education and support needs	• Voluntary email questionnaire	12; Medical	NA	NA; NA	NA	NA	• 92% expressed sensitivity toward colleagues • 58% appreciate help offered • 58% concerned on preventability and patients' safety • 58% learnt to deal with death, experience meant personally • 42% personally affected, expressed sense of loss

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								• "identification with the patient" (8%), "lack of support" (17%), "anger" (17%). • Anger and lack of support from inpatient psychiatry students
Mospan et al. (2020); US [51]	• Attitudes, perception of role in assessing suicidal ideation • Determine association of previous work experience with attitudes, perceptions	• Online survey containing modified ATTS[q]	73; Pharmacist	• First year	NA; 66% female	• 59% known someone with suicidal thoughts/plans/threats • 61% known someone with suicide attempt	• 12% completed Mental Health First Aid training (MHFA)	• 92% agreed/ strongly agreed suicide and mental health diseases are real • 93% agreed anyone can have ideation • ATTS scale median score 69: undecided • 79% agreed/ strongly agreed pharmacists have professional responsibility to assess suicide ideation • 56% refuse to discuss suicide ideation with their pharmacist
Neimeyer et al. (1983); US [52]	• Study skills in accurately assessing and responding to suicidal patients • Discover effective ness of value stance in management of self-destructive patients	• SIRI[r] questionnaire	141; Medical	• 41.8% first year • 58.2% third year	25.3y; 27.4 % female	NA	• Overall mean score 22.65: highly skilled to manage suicidal patient • Female (p<0.00025) , third year (p<0.029), those completing inpatient psychiatry rotation (p<0.0004) more skilled	NA
Patel et al. (2016); Australia [53]	• Predictors of confidence and comfort in providing future care to patients at risk	• Cross-sectional survey including SOSS[h] [39,54], LOSS[s] [54], mini IPIP-FFM[t] [55], Narcissism scale[u] [56]	116; Medical	• 32% Year 1 • 28% Year 2	25.0y; NA	• Moderate level of exposure to suicide (M= 5.0)[æ]	• Comfort (M= 7.4), confidence (M= 9.6) rated moderately, most in assessing and referring patients, minority in treating patients. • Greater previous personal exposure, increased contact with psychiatric	NA

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							patients associated with increased comfort, confidence	
Sato et al. (2006); Japan [57]	• Compare student knowledge, concerns about suicide • Examine attitudes toward suicidal behavior	• Paper questionnaire	160; Medical	• 36.9% first year • 32.5% third year • 30.6% fifth year	21.5y; 41.2% female	NA	• Overall mean score 4.21: moderate knowledge • Fifth year most knowledgeable ($p < 0.01$) • 42.5% cited mental disorders, 22.5% separation/ divorce/ widowhood as risk factors • Few students identified gender, age, personality, genetic factors, history of suicide attempts as risk factors • 70.0% answered age group for successful attempts was persons in 40s or 50s (wrong)	• <50% showed sympathy • Critical responses in first and third years
Scheckel et al. (2014); US [58]	• Obtain insights into basic preparation of students in the care of suicidal persons	• Unstructured interviews	11; Nursing	• Senior	21-26y; 100% female	NA	• Able to use psychiatric and general nursing knowledge to assess risk, help with prevention, use faith background to help	• Some fearing, nervous, apprehensive when facing patients • Stigma that suicide is selfish • Paternalistic, nursing centered approach

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Sun et al. (2020) , Taiwan [59]	• Explore psychological processes while caring for suicidal patients during first psychiatric clinical practicum	• Semi structured interview	22; Nursing	• Fourth year	20-23y; 95.5% female	NA	• Gradually becoming competent, confident, caring • Reframing of negative mindsets	• Most apprehension- worried incapable to deal with suicide • Most fear- perceived patients to be sensitive and easily hurt, might make self feel guilty • Many frustration- defensive patients, refused to reveal thoughts, difficulty building trusting relationships, ridged thinking, ruminations • Some powerlessness • Many confident, empathic, enhanced caring competencies with feedback and experience
Vedana et al. (2022); Portugal [60]	• Meaning of suicidal behavior	• Open, semi-structured interviews	13; Nursing	• 53.8% in 7th semester	53.8% 22y; 92.3% female	• 69.2% had been in contact with patients at risk	NA	• Complex, common phenomenon • Social dimensions as strong risk factors, protective factors, consequences of suicide • Difficult to identify, prevent suicide effectively, related to the psychological states, society's responses
Wahab et al. (2021); Malaysia [61]	• Attitudes towards suicide, help-seeking behavior, and factors affecting both components	• Cross-sectional survey with ATTS[w] questionnaire [62] and GHSQ[x] [63,64]	290; Medical	• 20% each from Year 1 to 5	22.4y; 49.7% female	• 6.2% has psychiatric history • 7.9% has family history of psychiatric illness	NA	• Strongly agree on preventing mental illness, helping, disagree to understand and accept suicide • Increased age: more understand and accept suicide (p= 0.023), see suicide to communicate (p< 0.001), normal (p< 0.001) • Males more likely understand and accept suicide (p= 0.007) • Those completed psychiatric posting tend to agree suicide to communicate (p= 0.008), normal (p= 0.003) • Those without psychiatric family history more oppose suicide, agree it is taboo (p= 0.047) • Those with psychiatric history more understand, accept suicide (p= 0.005), take it as normal (p= 0.019) • Those without psychiatric history more agree suicide not being justifiable (p= 0.004) • Those with previous formal training and/or teaching apart from psychiatry

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								posting more agree loneliness, avoidance as triggers (p= 0.037)
Williams et al. (2015); Australia [65]	• Opinions on certain types of patients and changes with education	• Cross-sectional survey with MCRS[y] [66]	554; Paramedic, paramedic/nursing	• 30.4% Year 1 • 42.6% Year 2 • 26.1% Year 3 • 0.9% Year 4	83% <25y; 69.1% female	NA	NA	• Self-reported empathy high: 48.17 • Single-degree less regard (p<0.0001) • Double degree positive change towards patients (p< 0.0001) • Double-degree highest regard (53.90) in second year of study, scores dropping significantly by third year. • Mean scores improved with degree progression • Female have higher regard (p = 0.027)
Zohn et al. (2022); US [67]	• Experiences while caring for patients at risk for suicide	• In-person interview	14; Nursing	• Immediately prior to or within three months of completing their baccalaureate degree	22-43y; 92.9% female	NA	• Able to identify patients needing additional screening • Unable to reliably deliver care due to resource restrain	• Perceive nurse's positive, supportive role to cultivate relationship, maintain professional boundaries, promote safety, extend hope and support • Empathized, advocated for patients • Some shock, hopelessness, disbelief, sadness, anger during various encounters
Hawgood et al. (2008); Australia [68]	• Need and feasibility for a suicide prevention (SP) curriculum	• Semi-structured phone interviews and surveys	373 ; Medical	• 45.3% 1st year • 40.2% 2nd year • 5.4% 3rd year • 9.1% 4th year	25.9y; 55% female	NA	• 30-50%: Specific skills-based items (e.g., working with suicidal persons, intervention and referral abilities) moderate or low	• 97%: SP capabilities were very important for future role • 80%: interested in further education • 69%: >50% of suicides are preventable
Price et al. (2022); US [69]	• Attitudes toward suicide prevention • Attitude changes during clerkship Safety Planning Intervention (SPI) initiative	• ASP[z] scale	360 ; Medical	• 63.1% 1st and 2nd year • 36.9% 3rd & 4th year	NA; NA	NA	• Disagree not comfortable assessing risk (p= 0.015)	• First and second year pre-clerkship students: more positive views (p=0.002) • All strongly agree suicide prevention is their responsibility (p= 0.005) • All disagree suicide attempters would not reveal intentions (p <0.001), attempt for attention (p <0.001) • Neutral to slightly agree it is easy for non-clinical members to judge (p= 0.041) • Neutral to disagree on right to take own lives (p= 0.031)

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								• Strongly disagree prevention are drain of resources (p <0.001), unpredictability of suicide (p= 0.009) • 86% preclerkship, 68% clerkship students agreed suicides were preventable
Domino et al. (1991); US, Japan [70]	• Attitudes towards suicide and cross-cultural comparison	• SOQ[e] [31]	• US: 100 ; Medical • Japan: 100 ; Medical	NA	• US: 19.1y; 20% female • Japan: 23.0y; 20% female	• 29% Japanese, 21% US[ǿ] seriously considered suicide • 4% Japanese, US attempted suicide • 42% Japanese, 45% US known someone who attempted suicide • 15% Japanese, 48% US known suicide victim that was more than acquaintance	NA	• Japanese agree Right to Die (vs undecided in US) • 15% Japanese normalize suicide (vs 9% in US) • United States male students more agree on suicide as aggressive • Males tend to agree religious values inversely related to suicide, parasuicide • Female tend to agree suicide is impulsive • 75% of Japanese, 35% of the US respondents agree with heroic suicides • 67% US, 30% Japanese feel sorry for victims, agree suicide more prevalent among the very rich & very poor.
Emul et al. (2011); Turkey [71]	• Compare attitudes of preclinical, clinical medical students, with students from other schools of study	• Questionnaires with SDS[€], SAS[¥], DS[§].	234 ; Medical	• 42.7% preclinical • 57.3% clinical	NA; NA	NA	NA	• 79.1% disagree renting to suicide attempter • 90.1% disagreed to leave child in the care of a suicide attempter • 60.3%: suicide attempters are impulsive • More preclinical students not want their children to marry a suicide attempter (p = .05), believed suicide is unpredictable (p = .043) • Tend to believe suicide attempters cannot control rage (p = .000) • More clinical students agreed to never forget previous suicide attempt (p = .040) • More female oppose suicide attempter to be a primary school teacher (p = .012) • 51.7%: hearing and speech abilities of suicide attempters were impaired
Eskin et al. (2011);	• Prevalence of suicidal behavior	• Self-report questionnaire on	• Austria: 320; Medical	Undergrad	• 22.4y; 49.4% female	• Lifetime, past 12-month, or current	NA	• More Austrian accept (2.83: neutral vs 1.71: disagree), take suicide as sign of

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Austria, Turkey [26]	• Attitudes towards suicide • Reactions to suicidal individuals	attitudes towards suicide [72][ł], reactions to suicidal individuals [72,73][λ].	• Turkey: 326; Medical	• 32.1% 1st year • 26.4% 2nd year • 17.6% 3rd year • 6.6% 4th year • 3.1% 5th year • 14.2% 6th year Postgrad • 29.8% first year • 22.4% second year • 23.0% third year • 15.6% fourth year • 7.4% fifth year • 1.8% sixth year	• 20.4y; 41.4% female	ideation more common in Austrian (37.8% vs 27.3%) • Lifetime and past 12-month attempts more frequent in Turkish (6.4% vs 2.2%)		mental illness (3.13: neutral vs 2.57: neutral), open reporting and discussion of suicide factors (3.51: agree vs 2.91: neutral), more Turkish believe in punishment after death (3.45: agree vs 2.68: neutral), hiding suicidal behavior (2.74: disagree vs 2.16 disagree). • Men tend to believe punishment after death (p<0.05), hiding suicidal behavior (p<0.005) • More Austrian women agree suicide as a sign of mental illness (p<0.01) • Turkish students more social acceptance (4.14: strongly agree vs 3.92: agree), emotional involvement (2.86: disagree vs 2.19 disagree), helping a suicidal friend (4.37: strongly agree vs 4.20: strongly agree) • Austrian tend to inquire into suicidal behavior (3.94: agree vs 3.24: neutral)
Etzersdorfer et al. (1998); India, Austria [74]	• Differences between the Viennese and Indian students and relation to culture	• SUIATT[η] [75] questionnaire	NA ; Medical	NA	• 18.4y; 51.5% female • 24.2y; 58.8% female	• 16.8% and 5.9% of Madras have suicidal ideation and attempts • 51.5% and 4.9% of Viennese have suicidal ideation and attempts	NA	• Vienna (69.3%): tend to see own suicide as more cowardly (smaller degree in Madras [40.6%]) • 50.5%: vs 26.7% Vienna tend to see suicide as deliberate • 27.7% vs 16.8%: Madras tend to see suicide as impulsive • Right to suicide totally rejected in Madras; in Vienna 20-30% rejected it
Wallin et al. (2003); Sweden [76]	• Attitudes towards suicide and suicidal patient and changes with time	• Self-administered questionnaire	306 ; Medical	• 47.1% first year • 52.9% fifth year	• 21.2y; 58.5% female	• 34%, 44% first and last year, reported lifetime suicidal ideation • 12%, 14% first and last year has suicidal ideation in the past year	NA	• More final year agree suicide is irresponsible (34% vs 17%), repeated suicide attempts means higher risk of suicide (51% vs 21%) • More female agree suicide attempters should receive psychiatric help (86% vs 75%, p < 0.05)

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						• 5%, 6% first and last year have suicidal ideation in past month • 1%, 2% of first and last year students had suicide attempt • Depressed mood/ anxiety in 12% • 39% applied for psychological or psychiatric treatment		• More male agree suicide attempts misuse medical services (19% vs 9%, $p<0.05$) • More final year agree antidepressants can prevent suicide (83% vs 65%, $p<0.001$), suicide as an expression of psychiatric disease (37% vs 13% $p<0.001$). • Those with suicide ideation less likely to report people with suicidal thoughts need psychiatric help (73% vs 84%, $p<0.05$), best treatment (74% vs 86%, $p<0.05$), view suicide as psychiatric disease (18% vs 31%, $p<0.05$)
Nebhinani et al. (2013); India [77]	• Attitude toward suicide prevention	• Cross sectional survey with Attitude toward suicide prevention scale[θ] [33]	308 ; Nursing	NA	20y; 95.1% female	• 22.1% seen a patient who attempted suicide • 11.4% seen a patient who committed suicide	• 51.3% comfortable assessing risk • 50.3% had some idea on risk prediction • 5.8% had professional experience to manage suicidal patient • 3.2% attended workshop on prevention	• 94.1%: prevention as their responsibility • 52.3%: positive attitude to work with suicidal patients, considered it rewarding • 64.9%: suicidal patients would not reveal their ideations • 63.9%: prevention measures leave little impact, unemployment and poverty are main causes • 54.9% defensive on efforts for prevention • 48.7% agreed right to take own lives • 31.5%: suicide attempt for attention • 23.7%: prevention as drain on resources
Sun et al. (2019); Taiwan [78]	• Develop a theory to guide the care of patients with suicidal tendencies	• Semi-structured interviews	22; Nursing	NA	20-23y; 95.5% female	• 4.6% had relative that attempted suicide • 9 patients taken care of were experiencing suicidal ideations, 13 attempted suicide	• Some lacked competencies to provide care • Students learnt risk assessment, protecting patients' safety, developing therapeutic communication competencies	• Some afraid might say or do something to cause suicide attempt, nervous, anxious initially • Some "Powerlessness" when caring "challenging" patients initially • Initially some nurses saw suicidal behaviour as stupid, irresponsible • Changing of mindsets

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							from clinical staff and patients	
Slobodanka Bašić et al. (2004); Serbia [79]	• Knowledge about and attitudes towards suicide	• A survey designed by author	150 ; Medical	• Final year	NA; 58.7% female	NA	• Majority occurs among young with great life expectations: 63.3% disagree (correct) • Leading cause of death among young in developed countries: 62.29%m.,56.82%f. agree (correct) • Attempts more frequent among female: 56.6% disagree (correct) • People who tell their intentions: a risk group: 22% agree (wrong) • Less chance of repeat suicide: 1 in 11 agree (wrong) • Alcohol as suicidal factor: 90.67% agree (correct) • Female agree chronic mental illness and suicide are related (correct), males not • Personal loss cause suicide: 76.67% agree (correct)	• Suicide is unpreventable: 79.3% disagree • End of suffering: 67.74% m, 69.32% f • Attention seeking: 54.67% • Due to insecurity: 74.14% • Alcoholics rarely commit suicide: 60.92% • Danger of suicide disappear in those out of depressive phase:>90%

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							• Majority with no warning: 60% disagree (correct) • Female more correct answers • S.O.S. services deter suicide attempts: 89.26% agree (correct)	
Oncü et al. (2008); Turkey [80]	• Attitudes of professional groups with potential importance in suicide and suicide prevention	• ATSS[O] [81]	41 ; Medical	NA	23.3y; 46.3% female	NA	NA	• Unpreventability: 2.12 (disagree) • Cause present: 3.38 (Neutral) • Loneliness as reason: 2.44 (disagree) • Right to suicide: 2.53 (neutral) • Incomprehensibility: 3.41 (agree) • Normal: 2.51 (disagree) • Taboo: 2.49 (disagree) • Not prepared to prevent suicide: 2.05 (disagree) • Impulsive process: 3.25 (neutral)
Fan-Ko et al. (2011); Taiwan [82]	• Learning outcomes of a suicide education programme	• Questionnaire[ŋ] [83]	79; Nursing	• Second year	26.8y; 97.7% female	• 43.7% had lifetime suicidal ideation • 27% had history of suicide in family	• 49.4% attended education courses previously • 39.3% had previous suicide care experience	• Acceptability 3.28 (neutral) • Morality, mental illness, right to suicide 3.11 (neutral) • Professional role, work and care 3.75 (agree) • Communication and attention 3.7 (agree)
Willson et al. (2020); US [84]	• Knowledge, confidence, and skills in identifying and preventing suicide after completing suicide training	• Survey[2]	158 ; Pharmacists	• First year	NA; 63% female	• 47% had previous experience with suicide ideation or suicide, either personally or with someone they knew	• 8%-71% correct on demographics of high risk population • 35%-61% correct on means • 61% correct on myth • 42-92% correct on first aid measures • 14-62% included all or	NA

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							most major points in answering	
Hjelvik et al. (2022): US [85]	• Effectiveness of a peer-to-peer suicide prevention workshop	• Survey[l] developed using Ajzen's theory of planned behavior [86]	273 ; Medical	• Year 1 and 2	NA; NA	NA	• Felt incompetent to help person at risk (2.67) • More neutral in confidence to ask peers (3.38), someone directly (3.37) on suicide • Somewhat aware of risk & interventions (3.70), warning signs (3.77), helpful resources (3.49)	• Strongly agree to intervene (4.42), accompany someone at risk to urgent care services (4.51) • Believe in ability to persuade someone for help (3.48) • Disagree could not prevent suicide (2.42)
Pothireddy et al. (2022); US [87]	• Develop a video case to help to recognize and manage suicide warning signs • Determine effect of intervention on knowledge, confidence, hypothetical suicide prevention communication and referral	• Survey[u] adapted from previous study [88]	139 ; Pharmacist	• Second year and third year students	23.8y; NA	• 26% close to someone who died by suicide	• Knowing what to say if someone expressed suicidal thoughts: 45 (disagree) • Confident to help: 51.4 (Moderate) • Can recognize suicidal thoughts or crisis: 56.5 (agree) • Ask about suicide when they said "I want to go to sleep and never wake up,": 59.1 (Agree) • 8% has previous suicide training	• Believe suicidal people get better with help and support: 82.9 (Strongly agree)

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Retamero et al. (2014); US [89]	• Evaluate the use, reception of the movie The Bridge as complementary to suicide curriculum	• Questionnaire	180; Medical	• Second year	NA; NA	NA	NA	• Lectures alone are sufficient to learn: 74.4% disagree/strongly disagree • Society no longer stigmatizes: 97.2% disagree/strongly disagree • Rarely second thoughts once decision made: 97.2% disagree/strongly disagree • Antidepressants: treatment of choice: 64.4% disagree/strongly disagree • Repeated threats: likely borderline personality disorder, threats should be taken very lightly: 97.2% disagree/strongly disagree • Problems understanding grief process of survivors: 66.1% disagree/strongly disagree • Nothing can be done to help a suicidal person: 88.9% disagree/strongly disagree
Yousuf et al. (2013); Hong Kong [90]	• Attitudes and experience after suicide prevention module	• CASQ-HK[ψ]	22; Medical	• Completed second or third year	20-23y; 32% female	• 13.6% had past suicidal ideation • 0% had attempted suicide • 18.2% knew of a person who had committed suicide	NA	• Disagree: Fatalism of suicide, stigmatization, Suicidal persons have similar backgrounds • Neutral: Sympathy towards suicide • Agree: negative appraisal, support towards suicide people, contagiousness of suicide, suicide caused by social factors, commit suicide for retaliation/ welfare of others • Female more negative in negative appraisal of suicide
Mckeirnan et al. (2023); US [91]	• Impact of Mental Health First Aid (MHFA) training on student pharmacist's attitudes, perception and knowledge	• OMS-HC[Ẅ][92] • Comfort and Willingness to Intervene Questions [84,93] • Confidence Questions [84,93]	205; Pharmacist	• Year 1, 2, 3	NA; NA	• 73% had personal or close acquaintance with mental illness • 54% had suicide or suicidal ideation • 54% knew someone with mental health crisis • 36% knew someone at risk of suicide	• Comfortable identifying warning signs of suicide and mental health crisis • Comfortable intervening in suicide and mental health crisis	• Disagree suicide unpreventable • Assume responsible to discuss personal issues with patients

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							• Comfortable applying ALGEE[x] tool [94]	
Carpenter et al. (2023); US [95]	• Impact of online suicide prevention training program on knowledge and self-efficacy	• Online survey[ẑ] [96]	146; Pharmacist	• 83.6% 2nd year • 16.4% 3rd year	23.6y; 67% female	• 19% knew someone died by suicide	• 8.9% had previous suicide prevention training • Moderate mean knowledge (1.3) • 40.4% correct on agents carrying warning label for the risk of suicidal behavior • 85.6% correct on suicide as a top 10 cause of death in US in 2019 • Moderate self-efficacy: identifying suicide, providing reassurance, referrals, and resources • Confident to listen without judgement • Less confident to decide necessity of medical intervention	NA

[a]UAE: United Arab Emirates; UK: United Kingdom; US: United States. [b]Items were rated (1= completely disagree,5= completely agree) and presented in mean.[c]SBAQ-ita scale: evaluated D1 "Feeling toward the patient," D2 "Professional ability," D3 "Right to suicide," and D4 "Knowledge. Responses rated (1 = completely disagree, 10 = completely agree), presented in mean. [d]SBAQ [29]: Suicide Behavior Attitude Questionnaire. Items are grouped into three factors, with scores of 0-30 points for each group. Factor 1 "negative feelings toward the patient", higher scores indicate a greater presence of negative feelings. Factor 2 "self-perception of professional competence", higher scores indicate more self-confidence in dealing with suicidal individuals. Factor 3 "right to suicide", higher scores represent a less "moralistic/condemnatory" attitude. Items presented as mean. [e]SOQ [31]: Suicide Opinion Questionnaire. Consisting of eight clinical sub-scales: "Suicide reflects Mental Illness"; "Suicide threats are "not real"– i.e. a "Cry for Help"; "Right to Die"; "Importance

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of Religion"; "Impulsivity"; "Suicide is Normal"; "Suicide reflects Aggression/Anger"; and, "Suicide is Morally Bad". Rated 'strongly agree', 'agree', 'undecided', 'disagree', and 'strongly disagree'. Nine specific questions had a reversed scoring. [f]QABSB: Questionnaire of Attitudes Before Suicidal Behavior. Data was clustered into three factors. Factor 1- negative feelings with suicidal patient, the higher the score, the more the presence of negative feelings. Factor 2- perception of professional competence to deal with patients with suicidal behavior, a higher score may mean more confident professionals. Factor 3- right to suicide, a higher score can mean at least "moralist/judicious" attitude. Each factor scoring varied from 0-30 points. Items presented as mean. [g]ATSP [33]: Attitude Toward Suicide Prevention. Evaluated on a 5-point Likert scale ranging from "strongly agree" to "strongly disagree". The higher the score, the more negative the attitude. [h]SOSS [39,54]: Stigma of Suicide Scale. 5-point Likert-type scale with three subdimensions: Stigma, Isolation/Depression, and Glorification/Normalization. Each item is marked "strongly disagree," "disagree," "uncertain," "agree," and "strongly agree". The weights of each subdimension is evaluated by considering the mean score for each subdimension. [i]DAP-R [40]: Death Attitude Profile-Revised. The scale consists of three subdimensions: Neutral Acceptance and Approach Acceptance, Escape Acceptance, and Fear of Death and Death Avoidance. The scale is evaluated based on both the scores for the subdimensions and the total score for the whole scale, high mean scores for the whole and subscales indicate a positive attitude toward death. The highest score that can be obtained from the scale is 182 while the lowest score is 26. [j]Suicide Attitude Questionnaire [42]: measured nursing students' attitudes towards suicidal behaviors in five domains: the acceptability of suicidal behaviors, morality, and mental illness, professional role, work and care, communication and attention, and belief from 1 (strongly disagree) to 5 (strongly agree). Possible score range 30–150, a higher score reflects a positive caring attitude towards suicidal behaviors. Data presented as mean. [k]LOSS-B: Bangla literacy of suicide scale. Adapted from the original instrument from Calear [47]. Assesses suicide literacy in: signs and symptoms, nature of suicide, risk factors, and preventive measures. Total score ranges from 0 to 12, calculated based on the correct answer. Data was presented as mean. [l]SOSS-B: Bangla stigma of suicide scale. The scale has three subscales: stigmatization, isolation/depression, and normalization/glorification, rated strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5) with each subscale score determined by calculating the mean of responses to items within the subscale. Data presented as mean. [m]SOQ: Suicide Opinion Questionnaire. Measure suicide on the basis of: permissiveness, unpredictability, incomprehensibility, noncommunication, right to prevent, preventability, relation cause, and duration of suicide process. The questionnaire was rated 1=strongly agree, 2=agree, 3= don't know, 4=disagree, and 5=strongly disagree'. Data presented as mean. [n]LOSS [47]: Literacy of Suicide Scale. Assess suicide literacy based on (a) signs and symptoms, (b) causes of the nature of suicidality, (c) risk factors, and (d) treatment and prevention. Literacy scores are the sum of correct items, with higher scores indicating higher suicide literacy. Data presented as mean. [o]General Help-Seeking Questionnaire [48] asks the question 'If you were experiencing suicidal thoughts, how likely is it that you would seek help from the following people?'. The sources were categorized as formal help, informal help and no help sought, with each item rated from 'highly unlikely' to 'highly likely'. Data presented as mean. [p]Adapted version of SOSS [39]: respondents were presented with a range of descriptors of a person who died by suicide/diagnosed with each condition and asked to respond to each item ranging from 1 (strongly disagree) to 5 (strongly agree). The SOSS produces three sub-scales assessing "stigma," "normalization/ glorification," and "isolation/depression." Mean score for each subscale was calculated; higher scores indicate greater stigma, glorification/normalization, and isolation/depression, respectively. [q]ATTS: Attitudes Toward Suicide. The authors reduced the ATTS scale from 39 to 22 questions to limit participant fatigue. Rating ranging from strongly agree (5) to strongly disagree (1). Data was presented as median. [r]SIRI: Suicide Intervention Response Inventory. 25 item questionnaire with forced-choice between the two response options, total score represents the number of correct options endorsed. Data presented in mean. [s]LOSS [54]: Literacy of Suicide Scale. The scale includes 12 statements assessing knowledge of suicide, rated as 'true/false/don't know.' Each correct response attracts a score of one, with total scale scores ranging from 0 to 12. Higher scores are indicative of greater suicide literacy. Data presented in mean. [t]IPIP-FFM [55]: International Personality Item Pool Five-Factor model. Assess participants' openness to experience, agreeableness, conscientiousness, neuroticism, and extraversion. [u]Narcissism scale [56]: Each item rated on a three-point 'true/false/don't know' scale, total scale scores ranging from 0 to 13, higher scores indicating greater narcissism. [v]Questionnaire assess knowledge concerning suicide in Japan (statistical data, risk factors, and suicide prevention measures). Eight multiple-choice questions and one open-ended question concerned the student's attitude toward suicidal behavior (classified by all authors' consensus as sympathetic, critical, unconcerned, and no answer). Data presented in mean. [w]ATTS [62]: Attitudes Toward Suicide. Scored ranging from 1 (strongly disagree) to 5 (strongly agree). 11 interpretable factors as "ability to understand and accept suicide" (D1); "suicide among youth and tabooing" (D2); "believability of suicidal threats" (D3); "loneliness and avoidance as suicide triggers" (D4); "judgment and ability to help" (D5); "nature of suicidal ideation" (D6); "acceptability of assisted suicide" (D7); "suicide as communication" (D8); "incomprehensibility" (D9); "normality of suicide" (D10); and "duty to prevent and mental illness" (D11) were assessed. Malay validated form was used [97]. [x]GHSQ [63,64]: General Help-Seeking Behaviour Questionnaire. Evaluate different help-seeking targets in response to two hypothetical scenarios in which a personal emotional problem and suicidal thoughts were experienced. Items were measured from 1 (extremely unlikely) to 7 (extremely likely).[y]MCRS [66]: Medical Condition Regard Scale. Capture a health professional's bias, emotions and expectations in treating a patient with specific condition and allow for comparison between them rated on from 1(strongly disagree) to 6 (strongly agree) (maximum score 66). Data presented in mean. [z]ASP: Attitudes to Suicide Prevention. 14 scale items, each coded from 1 (Strongly Disagree) to 5 (Strongly Agree). Total score (ranging from 14 to 70) and individual items were scored and compared among. Data presented in mean. [c]SDS: Social distance scale. Measures eight items related to social avoidance (each item scored from definitely unwilling, probably unwilling, probably willing, definitely willing).[y]SAS: Skillfulness assessment scale. Includes eight questions; rated where point 1 or 2 indicate definitely agree; 3,4 and 5 points indicate

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neutral; 6 and 7 points indicate definitely disagree. [§]DS: Dangerousness scale. includes eight questions; rated where point 1 or 2 indicate definitely agree; 3,4 and 5 points indicate neutral; 6 and 7 points indicate definitely disagree. [ɬ]Opinions and attitudes towards suicide [72]: responses to these items were made on 5-point scales (1: Completely disagree; 5: Completely agree). Data presented as mean. [ƛ]Reactions to an imagined suicidal friend[72,73]: requested participants to imagine a close friend who decides to kill herself or himself and reveals their reactions and feelings to the respondent using 5-point scales (1: Completely disagree; 5: Completely agree).[ɳ]SUIATT [75]: suicide attitude. Covers attitudes towards suicide and attempted suicide and epidemiological issues (previous suicidal ideation and previous suicide attempts). Responses to each statement are along a five point scale (strong agreement to strong disagreement). 19 subscales were derived.[ɵ]Attitude toward suicide prevention scale [33]: 14 items, self-rated on 5-point Likert scale. [ʘ]ATSS [81]: Attitudes Toward Suicide Scale. Rated from “strongly disagree” to“strongly agree” (strongly disagree = 1, undecided = 3, strongly agree = 5). Two of the attitude questions are rated differently, which are questioning probability of one’s own future suicide (a possibility = 1, under certain circumstances = 2, probably not = 3, never = 4), and to what degree suicide should be prevented (in all cases = 1, all but few exceptions = 2, in some cases yes, in some cases no = 3,not in any case = 4). The questionnaire also has two open ended questions asking about the most important cause of suicide and what should be done for suicide prevention. Data presented as mean. [ɑ]30 items [83] were divided into five categories regarding: the acceptability of suicidal behaviours, morality and mental illness, professional role, work and care, communication and attention and beliefs, rated on from 1 (strongly disagree) –5 (strongly agree). Possible score range of 30–150. High scores reflected positive caring attitudes towards suicidal behaviours. [ƶ]The survey [93,98] includes knowledge assessment (15 questions) pre and post training program.[ɭ]Sets of yes/no statements on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree) [86]. Item presented as mean. [ʉ]A slider was used to indicate level of agreement, ranging from 0= strongly disagree to 100= strongly agree [88]. Data presented as mean. [ʊ]CASQ-HK: Chinese Attitude toward Suicide Questionnaire. Contains 73 statements about attitudes towards suicide (1 = absolutely agree and 5 = absolutely disagree), and 12 difficulties-related scenarios (eg suffering from a chronic mental illness, business failure, etc) and participant’s likelihood of considering suicide in each scenario (1 = definitely not consider and 5 = definitely consider). [ʬ]OMS-HC[92]: Opening Minds to Stigma Scale for Healthcare Providers. Likert scale was used (5 = strongly agree to 1 = strongly disagree). [ƶ]NA: Not available. [ä]Suicidal thoughts were assessed on a scale of 0-10 (10: very frequent). [ɶ]Personal exposure to suicide was rated on a 10-point scale from ‘I have had no exposure to suicide’ to ‘I have attempted suicide myself’. [ɷ]US: United States. [ɐ]Items were rated (1= not at all sad,7= very sad) and presented in mean. [ɞ]Mood was assessed (1: Not at all sad; 7: Very sad) and presented as mean (M). [ɤ]AlGEE[94]: Approach and assess for risk of suicide or harm; Listen non-judgmentally; Give reassurance and information; Encourage appropriate professional help; and Encourage self-help and other support strategies. [ƶ]Consists of 2 components: knowledge (2 items on how many agents carried a warning label for the risk of suicidal behavior and whether suicide was a top 10 cause of death in the United States in 2019, scores ranging from 0-2, higher score indicates better knowledge) and self- efficacy (7 items measured on a 5-point scale ranging from 1 = not at all confident to 5 = extremely confident)[96].

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3.2. Study Characteristics

Where reported, the studies included a total of 8094 pre-clinical and clinical healthcare students, with around 65% of them being females and the mean age was 22.0 years old. Data was obtained from various countries, including the United States (US) (n=12) [34,50-52,58,67,69,70,84,85,87,89,91,95], Australia (n=5) [46,49,53,65,68], Brazil (n=4) [28,35,37,43], Turkey (n=4) [26,38,71,80], Taiwan (n=3) [59,78,82], India (n=3) [41,74,77], Austria (n=2) [26,74], Japan (n=2)[57,70], and one study each from the United Kingdom (UK) [32], Italy [27], Greece [30], Mexico [36], Bangladesh [44], Nepal [45], Portugal [60], Malaysia [61], Sweden [76], Serbia [79], and Hong Kong [90]. Three studies compared attitudes across different cultures i.e. between American and Japanese students [70], Austrian and Turkish students [26], and Austrian and Indian students [74]. Most studies focused on medical (n=24)[25,26,30,34,36,44,46,49,50,52,53,57,61,68-71,74,76,79,80,85,89,90] and nursing (n=17)[27,28,35-38,41,43,45,58-60,65,67,77,78,82] students, and a small number on pharmacy (n=5) [51,84,87,91,95], dental (n=1)[32], and paramedic (n=1)[65] students. Data collection was mostly through self-reported surveys incorporating validated or unvalidated questionnaires (n=39)[25-28,30,32,35,37,38,41,44-46,49-53,57,61,65,68-71,74,76,77,79,80,82,84,85,87,89-91,95,99] and interviews (n=8)[34,43,58-60,67,68,78]. The majority of studies were published after 2013 (n=33),[25,27,28,30,32,35-38,41,43-46,49,51,53,58-61,65,67,69,77,78,84,85,87,89-91,95] and about 50% of the studies (n=25)[25-28,30,36-38,41,45,51,53,60,61,70,74,76-78,82,84,87,90,91,95] collected information on personal exposure to suicide or mental health issues.

3.3. Key Findings

Two main themes were developed: (1) knowledge on and skills to manage suicide, and (2) attitude towards suicide. These themes and subthemes are illustrated below.

Theme 1: Knowledge on and skills to manage suicide

Subtheme 1: Skills in managing persons with thoughts of suicide. Six studies involving medical [52,68], nursing [58,59,78], and pharmacy [91] students discussed students' management skills encompassing suicide risk assessment, identifying those at risk, communicating, and dealing with persons with thoughts of suicide. The skills of the students could be described on a spectrum, whereby some students described themselves as having inadequate skills [58,68,78], while others had high skills [52,58,59,91]. It was noted that skills could be improved over time with increasing contact between clinical staff and persons with thoughts of suicide [59,78]. A study by Neimeyer et al [52] found that among medical students, female gender (p<0.00025), senior students (p<0.029) and those completing inpatient psychiatry rotations (p<0.0004) were significantly associated with better skills than their peers.

Subtheme 2: Knowledge of suicide. Seven studies involving medical [44,46,57], nursing [27], and pharmacy [84,91,95] students evaluated the overall knowledge of students. It was noted that students from developed countries such as Italy [27], Australia [46], Japan [57], and the US [84,91,95] were moderately knowledgeable as compared to their counterparts in Bangladesh who had poor suicide literacy [44]. Several factors that were associated with better knowledge were presence of lifetime suicidal ideation (p =0.020),[27] female gender [44,79], personal or family history of suicide attempts [44], those who attributed suicidal ideation to isolation or depression (p= 0.007), undergraduates (p<0.001), native English speakers (p<0.001),[46] and senior students of their respective courses [46,57].

Eight studies discussed medical [69,85], nursing [67,77], pharmacy [87,91,95], and dental [32] students' knowledge on suicide risk assessment. There were variations among medical and nursing students, with some being somewhat aware of warning signs [85] and comfortable assessing risks [69,77], while others were uncomfortable to perform suicide risk assessments [67]. Pharmacy students generally displayed good knowledge and readiness in assessing suicide risk [87,91], while 80% of dental students were unsure of what to do if a patient revealed suicidal thoughts [32].

Four studies evaluating students' knowledge on the causes, nature, treatment, and prevention of suicide discovered that medical [44,57,79,85] and pharmacy [84] students tended to have more

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knowledge on the treatment and prevention aspects as opposed to the causes and nature of suicide. For example, in a study by Sato et al [57], less than 50% of medical students were able to identify mental disorders and romantic relationship breakdown as risk factors for suicide. Only a few were able to identify the association between gender, age, personality, genetic factors, and history of suicide attempts with suicide. In another study, while more than 75% of medical students were able to identify risk factors for suicide, less than half of them were aware of the predictable nature of suicide [79]. In yet another study, less than 60% of pharmacy students scored correctly on the common means used in suicide attempts and myths related to suicide, such as the tendency of certain age groups or gender to attempt suicide [84]. Medical students, however, scored better when tested on treatment and prevention aspects in two surveys [44,79]. Some of the healthcare students, if not most, were aware of appropriate interventions and measures to help persons with thoughts of suicide [79,84,85].

Subtheme 3: Confidence in managing persons with thoughts of suicide. Nine studies involving medical [34,37,85], nursing [27,28,35,37], and pharmacy[87,95] students highlighted healthcare students' confidence in managing persons with thoughts of suicide including risk perception and confidence in the ability to help a person at risk or a person who attempted suicide. Overall, most students had low, while some had moderate confidence when dealing with suicidal patients. Nursing undergraduates generally displayed low confidence [27,28,35,37]. A survey done by Marques et al [37] found that males (p=0.00), those who completed a psychiatric nursing course (p=0.01), and those who had previous experience participating in a class or laboratory on suicide (p=0.03) had significantly higher confidence compared to their counterparts.

Meanwhile, Krueger [34] discovered that medical students from the US displayed low confidence in their competence in managing persons with thoughts of suicide, and the trend seemed to remain despite their progression through the course [85]. Medical students showed moderate confidence in another Australian study, with those having previous personal exposure and increased contact with psychiatric patients more confident than the rest of the students [53]. On the other hand, pharmacy students displayed moderate confidence in helping persons with thoughts of suicide as depicted in a simulation video case in a study by Pothireddy [87], though they were less confident in deciding on the appropriate timing for medical intervention [95].

Subtheme 4: Education and training experience in suicide. Seven studies highlighted nursing [28,77,82], pharmacy [51,87,95], and dental[32] students' engagement in relevant areas of education and training. There was a wide variety in engagement among the healthcare students, however overall, it was still low. Some nursing students had more exposure when compared to other healthcare students, specifically Taiwanese and Brazilian students. Around 50% of Taiwanese students had attended relevant educational courses previously and 40% had professional experience in managing suicide [82], while roughly 35% of Brazilian students participated in suicide prevention classes in the past [28]. Meanwhile, only 5% of nursing undergraduates in India had previous exposure to relevant training and experience [77]. Similarly, less than 15% of pharmacy [51,87,95] and dental students [32] had participated in previous extra-curricular education and courses on suicide. However, notably, among the three dental students who completed suicide awareness training two years prior to the study, one student managed to apply the learning in a real life situation [32].

Theme 2: Attitude towards suicide

Subtheme 1: Emotional reactions when facing persons who are suicidal. There were 16 studies that discussed the emotional impact of dealing with a person with thoughts of suicide on medical [25,26,34,50,57,70,89,90], nursing [27,43,58-60,65,67,78], and paramedic [65] students. While some medical students described themselves as not being personally affected,[26,50] others reported a wide range of positive and negative emotions when facing persons with thoughts of suicide. Some of them showed great concern [34] and somewhat sympathized with patients [70,90], though this was less likely among Japanese students whereby less than 50% of them felt sorry for the patients as seen in a study by Sato et al [57]. Others displayed grief, guilt [34], a sense of loss [50], and hostility [34,57].

On the other hand, many nursing undergraduates described feeling apprehensive and fearful that their actions or behaviors might worsen suicidal tendencies [58,59,78]. Some were frustrated as

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patients continuously ruminated on suicidal thoughts or refused to reveal their thoughts to the students [59], while others described powerlessness in response to similar circumstances [59,78]. In interviews conducted by Zohn et al [67] students disclosed remembering feeling shocked, sad, and angry during various encounters with patients. However, some nursing students and paramedic students did show high levels of empathy to persons with thoughts of suicide [65,67], with some feeling the need to advocate for them [67]. Females (p=0.027) were significantly more likely to empathize [65].

Subtheme 2: Negative and stigmatizing attitudes. Twenty studies revealed negative and stigmatizing attitude towards suicide among medical [25,26,30,36,44,46,61,69-71,74,76,79,80,90] and nursing [36,38,41,43,58,78] students. Suicide was depicted by some medical and nursing students as irresponsible especially among final year medical students [76,78], taboo [43,61], and an act borne out of the desire to die and manipulate others [43]. Some disagreed that persons with thoughts of suicide were struggling with isolation or depression [38,80]. Suicide was also seen as selfish [58], stupid [78], cowardly [74], an aggressive act [70], done out of an inability to control rage [71], and contagious [90], and hence should not be normalized [46,80] or glorified [38,46]. In a study conducted by Öz et al [38], suicide was significantly more stigmatized among those who were older ($p < 0.05$) and those with acquaintances who attempted suicide ($p < 0.05$).

Among medical students, some of them were unable to accept and understand suicide [61,74] as they agreed that no one had the right to take their own life [30]. Suicide was highly stigmatized [44], deemed morally bad [30], and thought to be punishable after death especially among Turkish [26] and male students [26,30]. A survey undertaken by Emul et al [71] in Turkey discovered that medical students had high levels of distrust about suicide attempters as 80% of them refused to rent a house to suicide attempters, and 90% of them refused to leave their children in the care of a suicide attempter.

Subtheme 3: Permissive or neutral attitudes. Twenty-seven studies highlighted medical [25,26,30,44,46,49,61,69,70,74,76,79,80,89,90], nursing [27,28,35,37,38,41,43,45,60,77,82], and pharmacy [51] students' relatively permissive attitude toward suicide. Some medical students were reported to have low levels of stigma [46,49]. They disagreed on the taboo placed on the topic [26,80], as they saw suicide as a mental illness or due to despair [30,46,76], particularly among those who were religious [25] and females who were from Austria ($p<0.01$) [26]. Those with more exposure and knowledge in terms of psychiatry and suicide were also more likely to agree that suicide was an act of communication [61,79], be it to grab the attention of someone [30,79] or for the retaliation or welfare of others [90]. Various possible contributing factors of suicide were acknowledged, including social isolation and depression [44], insecurity [79], and social factors [90]. Regardless, students tended to be neutral in normalizing [49,61], glorifying [44,49], and accepting [26] suicidal behaviour. Japanese students especially were more likely to acknowledge the right to suicide and glorify suicide [70], while Austrians tended to accept suicidal behaviour [26]. Those who were older (p= 0.023), male (p= 0.007), and had a personal history of mental illness (p= 0.005) were significantly more likely to understand and accept suicide as well [61].

Meanwhile, the majority of nursing students held a neutral [45] or positive attitude [28,35,37] toward suicide. Some of them did not have a particular stand on the aspects of morality [82], the right to suicide [27,28,82], suicide as a means of communication [41,43,77,82], and seeing suicide as a mental illness [82]. Others acknowledged the multifactorial influence of suicidal behaviour [60], and hence were less likely to condemn suicidal behaviour [28,35,41]. This was significant among those with a personal lifetime suicidal ideation (p= 0.040) [28], those who were older ($p < 0.001$) [41], and those with increased exposure to suicide via reading materials ($p = 0.01$)[37] or practicum ($p < 0.001$) [41].

Subtheme 4: Perceived nature of suicide. Nineteen studies discussed the perception of medical [34,36,49,68-71,74,79,80,85,89,90], nursing [36,43,45,60,77], pharmacy [91], and dental [32] students on the nature of suicide. Medical [68,69,79,80,85], pharmacy [91], and dental [32] students were inclined to agree that suicide is preventable, despite the fact that more than 50% of students [71,100] were unsure or disagreed on the predictability of suicide especially those who had a lack of clinical

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exposure to persons with thoughts of suicide [45,71]. On the contrary, nursing students agreed that suicide was difficult to identify and prevent [60] as the underlying cause of socioeconomic disparity [77] and society's stigma [60] was not resolved.

Some medical [80] and nursing [43] students also reported that suicide was incomprehensible to them, especially those who were of a younger age (p=0.046) and had never attended relevant psychiatric training (p= 0.021) [45]. Medical students from Turkey [71,80] were more likely to agree that suicide was an impulsive act with low controllability [49], whereas students from Austria [74] and the US [89] were inclined to agree on the deliberate nature of suicide.

Subtheme 5: Role in suicide prevention and management. Twenty studies highlighted medical (n=12)[25,26,34,36,50,68,69,76,80,85,89,90], nursing (n=6) [36,41,58,67,77,82], pharmacy (n=3) [51,87,91], and dental (n=1)[32] students' perceived role in suicide prevention and management. The majority of students from all fields expressed their agreement on their professional role to prevent [32,34,41,51,69,77,82] and manage [82] suicide except one study where more than 50% of nursing students were defensive about any prevention effort for suicide [77]. Most of them disagreed that suicide prevention or treatment was wasteful [36,69,77] or a misuse of medical resources [76]. They believed that with nurses playing a supportive role in the healthcare system [67,87,90], persons with thoughts of suicide could get better [87].

Despite showing concern for suicide prevention [50] and management via psychiatric treatment and antidepressants [76], some medical students reported being underequipped with suicide prevention skills [80]. They expressed interest for further relevant training as they acknowledged the importance of acquiring suicide prevention skills as a future healthcare professional [68]. Amiri et al [25] and Eskin et al [26] found that students had high social acceptance and desire to help their suicidal friends, especially those who were female (p=.012) [25]. Students would also intervene at times when needed [85], including inquiring into suicidal behaviour, especially among the Austrians [26], or accompanying the person to the healthcare services [85].

4. Discussion

This scoping review provides an overview of healthcare students' knowledge of and attitude towards suicide. Learning how healthcare students view and think about suicide is vital as this will affect the care provided to the patients in the future. From here, strategies could be devised to develop or improve educational programmes and build healthcare professionals that are able to provide holistic management and care to aid the survival of patients who are suicidal [101].

From this scoping review, it was found that on the whole, healthcare students were generally concerned about persons with thoughts of suicide. Findings involving healthcare professionals were similar, as they tended to admit patients at risk and consult other colleagues after witnessing inpatient suicides [102,103]. Healthcare students also demonstrated relatively high levels of knowledge towards prevention and treatment of suicide, as opposed to the cause and nature, highlighting the tendency of the public be reactive rather than proactive when dealing with mental health issues [104].

This scoping review also found that some nursing students were better prepared with higher professional skills in the management of persons with thoughts of suicide and had good knowledge, given their relatively better training and exposure to suicide [105], which was still overall quite low. This finding supports the literature in highlighting the importance of training in improving knowledge and attitude towards suicide [106-114]. Overall, they still reported low confidence in providing management due to the fear of saying something inappropriate and making the situation worse [115]. The findings among nursing students were similar to that from nursing professionals, whereby a majority of them reported low confidence in management given the minimal training and education on suicide received [116,117]. In our scoping review, nursing students saw suicide as a means to communicate, and agreed that victims were often struggling with isolation or depression, consistent with present studies [118,119]. However, they tended to avoid talking about suicide as they felt anxious and powerless from the inability to help and the lack of therapeutic response despite best care [120]. Nursing students were also less likely to stigmatize and judge against persons with

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thoughts of suicide. This was inconsistent with findings among nursing professionals who viewed suicide as morally wrong or as a mental illness [121-125], although they showed an improvement in attitude over time due to increased training and education on suicide [126,127].

Like doctors [128], medical students were also more likely to condemn the rights to suicide, as they tended to stigmatize against suicide and agree that suicide is not a normal phenomenon that should be glorified. This could be due to the association of suicide with personal weakness, which was commonly stigmatized against in an academically competitive environment [129]. The lack of training and education played a role as well [106-112,114,130]. Negative attitude and stigma against suicide has been reported to lead to compromised healthcare [131-133], and this could explain the lower ability of medical students in managing persons with thoughts of suicide. The provision of less than optimal care to those with thoughts of suicide was also noted in a study involving primacy care physicians [134-137].

Cultural and religious influences could shape attitudes towards suicide. For example, Austrian and Japanese students were more likely to normalize and glorify suicide. For the Japanese, suicide was historically honourable when done to gain control on life [138] or over death [139]. Meanwhile, findings for Austrian students indicated that suicide was seen as a deliberate act and a decision with rationale [74] and should be respected. Meanwhile, Turkish students were more likely to believe that suicide would lead to punishment after death, as Islam viewed suicide as sinful[140] and prohibited suicide strictly [141]. In this review, Indian students completely rejected suicide since it was seen as a cowardly and impulsive act from uncontrolled emotions and mental illness [74]. Traditionally in the Indian culture, suicide is deemed as a sign of "weakness of mind", and that those who carried out suicide were expected to be "stronger" and "seek solution from God" [114]. Those who attempted suicide are blamed and showered with guilt [114], although Hinduism (adhered to by 80% of Indian population)[142] does not specifically prohibited suicide [143], indicating a larger role of culture compared to religion in this context. Despite urges to decriminalise suicide, suicide remains a criminal offense to date [144], which might have contributed to the attitude of the Indian students as well.

Demographics seemed to play a role whereby our review suggested females were more likely to have better knowledge, skills and attitude, and increased perception of personal role and responsibilities in suicide management and prevention. They displayed higher levels of empathy [145], which could alleviate psychological distress and suicidal ideation [146]. Besides, those who were older generally held a more positive attitude toward suicide as they were more likely to accept, understand, and normalize suicide, in contrast to a study involving health professionals [147], which was likely due to desensitization with increasing clinical exposure toward suicide [148]. Meanwhile, our scoping review demonstrated those who were younger were less likely to comprehend suicide. Findings from other studies were ambiguous, highlighting a need for further exploration of this aspect [62,121].

In our review, personal exposure to suicide were associated with increased suicidal literacy, confidence in managing a person with thoughts of suicide, and reduced stigma as they were more likely able to empathize, understand and respect those with suicidal intentions [149]. Similar findings were discovered among healthcare professionals with personal and family history of mental illness [149].

4.1. Strengths and Limitations

This is the first scoping review available to provide a comprehensive overview of healthcare students' knowledge of and attitude towards suicide at a global level. However, this review only included English studies, which might lead to language bias. Furthermore, the stringent search terms might have caused data loss. Most studies included used self-reported questionnaires, which predisposed the review to reporting bias based on social desirability. Given that 30% of the studies included were undertaken before the year 2013 and the cross-sectional design of the majority of studies, this review might not reflect the most contemporary knowledge of and attitude toward suicide.

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4.2. Future Research and Recommendations

Considering that two thirds of suicides occur in developing countries,[1] and the underrepresentation of the studies from these countries in the review, more studies need to be conducted in these countries. Besides, more studies on students from other healthcare professions such as pharmacy and dentistry need to be conducted, as there is evidence of the role these professions could play in suicide prevention [150,151]. Despite the possible role of religiosity in affecting attitudes towards suicide [143,152-154], most studies in this review did not include this aspect in their results, hence the need for future studies to take this into consideration.

Furthermore, given the lack of knowledge and negative attitude among medical students, more studies should be conducted to address the contributing factors. Evaluation of medical curriculum should be undertaken to include relevant training programs that were shown to be effective to improve knowledge and attitude towards suicide. One study indicated that training community facilitators, including healthcare professionals, improved their knowledge, confidence, attitudes, and interventions when dealing with persons with thoughts of suicide [155]. In addition, a scoping review on suicide prevention programs found that training healthcare professionals and students improved their knowledge, behaviour, engagement in health services, as well as gatekeeper role outcomes [156]. Indeed, various studies have demonstrated the effectiveness of gatekeepers' training programmes[157,158] in sessions as short as one hour,[159] educational interventions,[160] workshops [85], movies [89], simulations [161], and modules [90] in improving medical students' knowledge and attitudes.

Specifically, gatekeepers' training programmes have been widely applied among the public and have shown satisfactory and sustainable effectiveness [162,163] up until five months, in improving knowledge and skills in suicide prevention and intervention [109,111,163-171] and attitude [162,163,170] as evidenced by a systematic review [172]. Such programs should be organised and incorporated in medical curriculla, though further adaptations are still required to develop locally and culturally sensitive programmes [167,173]. Some examples with proven efficacy include Mental Health First Aid [174], Signs of Suicide (SOS) [175], Question, Persuade, and Refer (QPR) [96,110,111,163], Applied Suicide Intervention Skills Training (ASIST) [111], and Connect [109]. Studies have showed that medical staff who underwent ASIST, a 14 hour programme developed in Canada in 1983 with strong focus on training via simulations [176] possessed greater confidence in managing individuals with thoughts of suicide compared to other training programmes [111] as well as an increase in knowledge and positive attitude sustainable for years [176]. This was due to the fact that instead of referral to healthcare professionals as in other programs, it aimed to connect the individuals to community resources for suicide prevention and intervention [176].

5. Conclusions

Healthcare students showed a positive attitude in their role to treat and prevent suicide, and to support persons with thoughts of suicide. Medical students showed a relative lack of knowledge and more negative attitudes compared to nursing students, highlighting the need to evaluate current medical curriculum on suicide. The incorporation of gatekeepers' training programmes into medical curriculla should be considered. Given the relative lack of data from developing countries and certain healthcare professions, future research should aim to address the current gaps.

Supplementary Materials: The following supporting information can be downloaded at website of this paper posted on Preprints.org.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A.

Research Strategy:
Method of search:

- Studies from database inception to 31st December 2023.

Databases used for searches:

- PubMed
- Cochrane Database of Systematic Reviews
- Cochrane Central Register of Controlled Trials (CENTRAL)
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- Excerpta Medica dataBASE (EMBASE)
- PsycINFO
- Database of Abstracts of Review of Effects (DARE)

Inclusion and exclusion criteria

1. Inclusion criteria

Studies that fulfilled the following criteria were included:

a. Studies that evaluated the attitude and/ or knowledge on suicide and/ or suicide related programs, and involves healthcare students from professions such as medicine, nursing, pharmacists, dentistry, and allied health such as paramedics, oral health therapists, and dental therapists as study population.

2. Exclusion criteria

Studies which met any of the following criteria were excluded:

a. Reviews, systematic reviews, meta-analyses, conference abstracts, conference proceedings, in vivo studies, in vitro studies, animal studies, thesis, and letter to editors.

b. Studies that were written in other languages than English.

c. Studies without available abstracts and full texts.

d. Studies that evaluated healthcare students with special training in psychiatry such as psychiatric trainees, psychology students and mental health nurses, and midwives.

e. Studies that evaluated healthcare students' suicide rate and suicidality.

f. Studies that evaluated healthcare students' attitude and/ or knowledge on physician assisted suicide.

g. Studies with outcomes that are not specific, such as the attitudes towards both depression and suicide.

h. In studies which evaluation of an intervention is the focus, pre-test attitudes or knowledge assessments are unavailable.

Search terms

Healthcare term: "healthcare" OR "health" OR "medic*" OR "pharmac*" OR "dentist*" OR "dental*" OR "allied health" OR "nurs*"

Student term: "student" OR "undergraduate" OR "postgraduate" OR "trainee" OR "intern" OR "future doctor"

Knowledge & attitude term: "knowledge" OR "attitude" OR "understanding" OR "awareness" OR "clarity" OR "thought" OR "opinion" OR "comprehension" OR "insight" OR "approach" OR "belief" OR "believes" OR "mindset" OR "sentiment" OR "perspective" OR "outlook" OR "notion"

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OR "stand*" OR "view*" OR "feedback" OR "percep*" OR "expect*" OR "behaviour" OR "behavior" OR "willingness" OR "practice" OR "training" OR "literacy"

Suicide term: "suicide" OR "self-killing" OR "self-immolat*" OR "self-poison*" OR "overdose" OR "self-harm" OR "suicidal" OR "ideation"

Search strategy

1. Search healthcare term (A)
2. Search student term (B)
3. Search knowledge & attitude terms (C)
4. Search suicide term (D)
5. Combine healthcare, student, knowledge & attitude, and suicide terms (A+B+C+D)
6. Exclude reviews, systematic reviews, animal studies, and other non-research articles.
7. Screen titles and abstracts for studies evaluating healthcare students' knowledge of and attitude toward suicide.

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