Is There an Association Between Dietary Habits and Recurrent Deliberate Self-harm?

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Abstract

Purpose Despite increasing awareness of high rates of physical illness and poor lifestyle behaviours among patients with a history of suicidality (suicidal ideation and behaviours), there is little research on specific lifestyle factors that are potentially problematic for this group. This paper aims to explore the relationship between frequency of deliberate self-harm and certain lifestyle factors, including balanced meals, eating breakfast, consumption of 'unhealthy' food, weight, exercise, substance and alcohol use, smoking and social support, in a cohort of patients who present to the Emergency Department (ED) with suicidality.

Methods From 2007-2016, data from lifestyle and mental health measures were collected from 448 attenders at an outpatient clinic for suicidal behaviour following an ED presentation. Lifestyle behaviours (from Fantastic Lifestyle Checklist) and mental health (from Depression and Anxiety Stress Scale, clinical diagnosis and number of previous deliberate self-harm episodes) were measured on arrival. The associations between lifestyle variables and mental health outcome measures were examined.

Results Gender, age, depression symptoms, poor diet, and smoking were all associated with a higher average number of DSH episodes. There were nonsignificant positive trends between all the other poor lifestyle behaviours and deliberate self-harm. There was no association between deliberate self-harm episodes and diagnosis of depression or anxiety disorder. In a multiple linear regression model the only factors that remained significant were age, smoking and eating balanced meals.

Conclusion In this sample of patients with suicidal behaviour, balanced meals and smoking were the lifestyle behaviours that were found to have the strongest independent association with repeated deliberate self-harm. We suggest that asking two simple questions about current smoking and balanced meals has the potential to direct the focus on modifiable lifestyle behaviours with important long term implications for individuals and public health implications for the group of people presenting with suicidality.

Background

While suicide risk and prevention are the focus of public policy around the world (1), there is now also an emerging interest into other sources of morbidity and mortality associated with this group of patients. Hawton's group (2) found that not only is deliberate self-harm (DSH) associated with increased risk of death by suicide, but also death from most natural causes, including respiratory disease, circulatory, neurological, endocrine, digestive, skin and musculoskeletal and connective tissue disorders. Another study (3) followed up 30950 patients who presented to hospital with DSH and reported deaths due to natural causes were 2–7.5 times more frequent than in the general population. Mean years of life lost (YLL) for natural cause deaths was around 25 years. Diseases of the circulatory and digestive systems were major contributors to YLL from natural causes. They concluded that in the management of self-harm, clinicians should consider patients' physical needs. The finding also suggests that there may be

detrimental lifestyle factors associated with DSH that predispose these patients to premature death from all causes.

Previous research on lifestyle factors associated with suicidal behaviour has focused on substance abuse and related disorders, including alcohol abuse and smoking. There is extensive literature reporting that alcohol abuse is strongly associated with suicidal behaviours (4–6) and with repetition of DSH (7). Furthermore, patients with a history of DSH are significantly more likely to die of digestive disease than people in the general population and these deaths are correlated with alcohol use, suggesting that problematic drinking is one of the causes of increased rates of premature death among self-harming patients (3). Moreover, an Australian population-based cohort study found that self-harm among adolescents was significantly related to high-risk alcohol use, cannabis use and cigarette smoking (8). Other studies have demonstrated a dose-response relationship between cigarette smoking and risk of suicide (9). In addition to smoking, a large population-based cohort study (10) also found obesity and living alone to be significantly associated with suicide. This finding has been supported by other researchers (5), who found 'lack of confidants' to be associated with suicidal ideation in both genders. Similarly, risk of self-harm has been found to be 11 times higher for separated and divorced people than for those not in that category (11).

While the importance of smoking, substance and alcohol abuse and social supports is already recognised by clinicians in routine psychosocial history taking, there is now emerging awareness of the importance of cardiovascular/metabolic risk factors, including diet, exercise and obesity. Jacka and Berk (12) proposed that diet, exercise and smoking are independent risk factors for depression.

Several randomised controlled clinical trials have examined the effect of exercise on depression, but few studies have explored the effects of exercise on suicidal behaviour per se. To our knowledge, there has only been one study (13) that has explored this link and found that exercise was directly related to suicide risk, after adjusting for depression, post-traumatic stress symptoms and sleep disturbance in a sample of veterans. Diet is a somewhat more difficult variable to define than exercise, hence the methodological inconsistency among the studies on the subject (12).

Some studies have compared a diet high in 'wholefoods' with one high in 'processed foods' and found the 'wholefood' diet to be associated with a decreased risk of depression, independent of a range of confounding variables (14). Another study found that the Mediterranean diet, particularly high in B vitamins and omega-3 essential fatty acids (EFAs), significantly lowered the risk of depression (15).

Emerging from the well-documented links between coronary artery disease and depression (16–18), there are now also many studies exploring the significance of omega-3 for mental health. Hallahan and colleagues (19) conducted a recent systematic literature review and meta-analysis of double-blind randomised controlled trials evaluating the efficacy of omega-3 highly unsaturated fatty acids in the treatment of depression. Their evidence suggests therapeutic benefit in the treatment of depression with omega-3 eicosapentaenoic acid (EPA)-predominant formulations, compared to placebo. To date there has only been one study (20) that directly compared the efficacy of omega-3 EPA and antidepressant

medication (rather than placebo) for the treatment of depression. They found EPA and fluoxetine had equal clinical benefit in the treatment of depression and that the two in combination were more effective than either alone. However, given that the therapeutic benefits of omega-3 in treating depression is a relatively new area of interest, it is perhaps unsurprising that a recent Cochrane review (21) found only a mild-to-modest, non-clinically beneficial effect of omega-3 fatty acids, and concluded that more research is required before more robust conclusions can be drawn. A recent review of the role of fatty acids in the neurometabolic pathophysiology of psychiatric disorders concluded that “together with associated pathophysiological systems - including biological stress (HPA-axis and oxidative stress), inflammation, and brain network structure and function - fatty acid alterations form a complex neurometabolic network that seems to alter the vulnerability for psychiatric disease. Clinically, this neurometabolic network can be positively influenced by lifestyle modification”. The review considered depression, anxiety disorders, stress and schizophrenia, but not suicidality, although these conditions play a significant role in the evolution of suicidality.

Jacka and colleagues (22) conducted the world’s first randomised controlled trial comparing the effects of social support (known to benefit people with depression) and dietary interventions in the treatment of clinical depression. They demonstrated that one third of patients receiving support by a clinical dietitian over three months met criteria for remission of major depression, compared to 8 percent of patients who received social support only. These results were directly proportionate to the extent of dietary change and not explained by weight loss or physical exercise alone. In another study, Jacka and colleagues (23) reported “lower intakes of nutrient-dense foods and higher intakes of unhealthy foods are each independently associated with smaller left hippocampal volume”.

Two observational studies demonstrated similar results when exploring the dietary differences between suicide attempters versus non-attempters. A retrospective population-based study of almost 7000 adults (24), found that fruit, vegetables and meat, particularly fish/seafood, were significantly under-consumed in adults who were suicide attempters compared to non-attempters. This relationship remained significant after adjustment for various factors, including socioeconomic status, smoking, total caloric intake as well as medical and psychiatric illness. The second study (25) compared the macronutrient intake of suicide attempters and non-attempters found that while there was no difference in total daily caloric intake, the percentages of calories derived from polyunsaturated fat (such as omega-3 and 6) and from fibre (typically from wholegrain foods, fruits and vegetables) were significantly lower among attempters, especially attempters who smoke cigarettes, than non-attempters.

While most studies have focused on the nutritional components of an individual’s diet, there are a few studies that have examined specific dietary habits, such as eating breakfast. This is of interest given the evidence that eating breakfast significantly reduces one’s risk of cardiovascular disease (26), and is correlated with decreased stress, depression and emotional distress (27). A large cross-sectional study of Japanese factory workers (28) found poor mental health was associated with skipping breakfast and consuming a nutritionally imbalanced diet. While there appears to be consistency in the limited observational data available on diet, evidence of the association of suicidal behavior with obesity is more

conflicted. A recent systematic review (29) demonstrated the contradictory and complex relationship between obesity and suicide, with some papers suggesting it is a protective factor while others finding the opposite.

In addition to the research on lifestyle factors, there is also growing interest in gastrointestinal microbiota as an important facilitator of stress adaption and immune response, with potential to impact anxiety and fear responses, and possibly produce despair or anhedonia (30,31). This provides an extra impetus to consider possible connections between diet and mood.

As lifestyle interventions are relatively new to psychiatry, there are no clear guidelines regarding formal assessment of problematic behaviours, such as poor diet. The Fantastic Lifestyle Checklist (FLC) (32) was recently found to be a valid tool for measurement of lifestyle behaviours in a sample of patients with suicidal behaviour (33). We have previously reported a significant difference between the overall FLC scores of people presenting with first episode, compared to repeat episodes, of suicidality to the Green Card Clinic (GCC) at St Vincent's Hospital Sydney (34).

The purpose of our study is to further explore the relationship between a range of lifestyle factors and suicidality among patients who present to the emergency department with suicidal behaviour. In this study we focused on diet, exercise and obesity, but also included substance and alcohol use, smoking and social support, with the hypothesis that all of these lifestyle factors will be significantly associated with repeated DSH episodes.

Methods

Procedure

This study used data collected from patients who attended the GCC at St Vincent's Hospital. The details of the GCC are discussed more fully in previous papers (33–35). In summary, following presentation to the Emergency Department with suicidal behaviour or ideation, all patients receive routine medical and psychiatric assessments (by an emergency doctor and psychiatry registrar). If deemed appropriate for discharge from hospital, the psychiatry registrar will consider referral to the GCC if: (1) the patient is not already under the care of their own psychiatrist/psychologist or community mental health team, (2) they speak English, and (3) they do not have a permanent impairment in cognition. On arrival to their first clinic appointment, patients are asked by the clinic receptionist to complete a number of assessment measures, including those outlined below. Patients included in this study were also given information and the opportunity to consent to their de-identified data being used for the purposes of research. The St Vincent's Human Research Ethics Committee approved the use of this data for this purpose.

Participants

From 2007 to 2016, of the 665 attenders at their first GCC appointment, 448 provided complete data including current presentation, age, sex, marital status, past history of DSH, psychiatric diagnosis, and self-report measures, as noted below. There were no significant demographic differences between those with complete data and those without. The mean age of clinic attenders was 31.7 years (SD = 10.6 years, range 17–69 years) and 59.1% of attenders were female. Of these, 107 (23.9%) attenders had never engaged in DSH, 162 attenders (36.2%) reported one previous episode of DSH and 179 (40.0%) reported 2 or more previous episodes of DSH. Most (74.5%) attendees were single, 15.9% were married or in de facto relationship, 8.9% separated or divorced and 0.7% widowed. The reasons for their ED presentation were overdose (40.8%), suicidal ideation (41.7%), cutting (10.3%), hanging (1.6%), jumping (2.0%) carbon monoxide poisoning (0.2%) and other (3.3%).

The patients' principal psychiatric diagnosis was recorded following assessment by the GCC clinician (psychiatrist, psychiatry registrar, psychologist or mental health clinical nurse consultant) and consensus by the team. Diagnoses included depression (33.1%), anxiety (10.7%), personality disorder (4.1%), psychosis (0.2%), substance use disorder (SUD; 18.9%), gambling addiction (0.9%), eating disorder (1.1%), adjustment disorder (11.9%), acute stress reaction (1.6%), situational crisis (13.9%) and relationship issues (2.7%). Three people did not have a diagnosis recorded.

Measures

The Fantastic Lifestyle Checklist (FLC) assesses 11 lifestyle domains using the acronym FANTASTIC (family, friends, activity, nutrition, toxins, alcohol, stress, sleep, personality type, insight and career). The 25 items within these domains include communication, giving/receiving affection, receiving emotional support, exercise, relaxation, eating balanced meals, eating breakfast, consuming excess sugar, salt, animal fats or junk food, weight, smoking, drug abuse, caffeine, alcohol, sleep, screen time, stress, impatience, aggression, anger, optimism, anxiety, depression, job satisfaction and relationships. Each item is scored on a 3-point Likert scale from 0 (*hardly ever*), 1 (*some of the time*), to 2 (*almost always*). There is some variation in wording depending on the item and some items are reverse scored.

The Depression Anxiety and Stress Scales–21 Item Version (DASS–21) (36) measures three negative emotional states (depression, anxiety and stress). The two scales assessing depression and anxiety were used in this study. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest, anhedonia and inertia. The anxiety scale assesses autonomic arousal, muscle tension, situational anxiety and subjective experience of anxiety. Respondents rate the extent to which they have experienced each state over the past week on a 4-point Likert scale ranging from 0 (*never*), 1 (*sometimes*), 2 (*often*) to 3 (*almost always*).

Outcome measures

The outcome measure for this study was the total number of self-reported lifetime suicide attempts, including the current presentation.

Statistical Analyses

The data were analysed using the Statistical Package for the Social Sciences (SPSS, v22, IBM Corporation, 2013). Descriptive statistics were used to quantify baseline outcome measures and other variables (including demographics, psychiatric diagnosis and lifestyle factors). For the purpose of analysis, several dichotomous variables were created. The two groups in the marital status variable included single/separated/divorced/widowed and married/defacto. The diagnosis variable was made into 3 separate dichotomous variables, (1) depression and all other diagnoses (as listed above), (2) anxiety and all other diagnosis, and (3) substance use disorder and all other diagnoses. In forming dichotomous variables from the lifestyle factors, the decision was made to isolate the most extreme negative response. For example, the balanced meals variable was divided into the two groups: (1) '*hardly ever*' and (2) '*some of the time*' or '*almost always*'. The exceptions to this rule were the smoking and drug abuse variables. The smoking variable was divided into the two groups: (1) smokers ('*occasional use*' or '*daily use*'), and (2) non-smokers. Likewise, the drug abuse variable was divided into two groups of people who abuse drugs: (1) '*some of the time*' or '*frequently*' and (2) '*never or seldom*'.

The rationale for this was that the middle response options for the smoking and drug abuse variables were particularly difficult to quantify, and considering there is no amount of smoking or drug abuse that is considered 'safe' by national guidelines (unlike alcohol) (37), this seemed to be the most logical way to divide these variables into two groups. Additionally, research shows that risk of death from suicide tends to be primarily associated with amount of alcohol consumed per drinking day, rather than drinking frequency or overall alcohol consumption, which supports guidelines that limit consumption to 2 drinks or less per drinking day (38).

One-way ANOVA and correlation analyses were used to explore the relationship between the number of lifetime DSH episodes and a range of variables including gender, marital status, depression, anxiety, substance use disorder (SUD) and the list of dichotomous lifestyle variables (as described above). Demographic and diagnostic variables that were found to have a significant relationship with the number of DSH episodes were included in a multiple linear regression model to assess the predictive ability of the various lifestyle and demographic variables.

Results

Characteristics of the sample are described in Table 1. Demographic, clinical and lifestyle data were explored by the number of lifetime DSH episodes. There was a significant gender difference, with females having a higher average number of DSH episodes than males (2.0 ± 2.8 vs. 1.4 ± 1.9 , $F(1,447) = 6.7$, $p = .01$).

Similarly, there was a significant effect for age, with younger age being associated with a higher number of DSH episodes ($r = -0.17$, $p < .01$).

Insert Table 1 about here

There was no significant association between the number of DSH episodes and marital status or diagnosis of depression, anxiety or substance use disorder (see Table 2). However, a greater number of DSH episodes was associated with higher scores on the DASS depression scale, with a weak effect size ($r = 0.11$, $p = .03$). The only lifestyle variables that demonstrated a positive relationship with the number of DSH episodes were tobacco smoking and diet. Current tobacco smokers had a higher number of DSH episodes (2.0 ± 2.5 vs. 1.3 ± 2.6 , $F(1,443) = 9.2$, $p < .01$). Those who reported they “hardly ever” ate balanced meals also reported more lifetime DSH episodes (2.3 ± 4.0 vs. 1.6 ± 1.9 , $F(1,447) = 7.5$, $p < .01$).

Insert Table 2 about here

All the other lifestyle variables, including excessive alcohol, minimal emotional support unhealthy body weight, high junk food consumption, not exercising and not eating breakfast demonstrated nonsignificant effects.

As substance use is likely to affect other lifestyle factors, we compared those with and without a diagnosis of substance use disorder. There was evidence of co-occurrence between several key behaviours; of the 86 participants with a diagnosed substance use disorder, 65 (75.6%) also currently smoked tobacco. Similarly, of the 90 people who “hardly ever” ate balanced meals, 63 (70.0%) were current smokers.

Table 2 presents the multiple linear regression model ($F = 2.280$, $p = .011$, $R^2 = .068$) that includes age, gender, DASS depression and all the lifestyle behaviour variables. Smoking, eating balanced meals and age were the only variables that were significantly associated with higher lifetime DSH episodes.

Discussion

A recent review (39) concluded that “lifestyle behaviours including cigarette smoking, alcohol use, and sedentary lifestyle are associated with suicide risk in all age groups” and for adults, “psychiatric symptoms, substance and alcohol abuse, weight, and occupational difficulties seem to have a significant role in suicide risk”. However, most of the research cited in adults focuses on people with a history of mental illness. Participants in our sample did not have chronic mental illness (such as schizophrenia or bipolar disorder) with concomitant symptoms of poor diet, metabolic syndrome and excessive smoking. Furthermore, less than half had a clinical diagnosis of depression or anxiety disorders. They were more representative of people arriving at an Emergency Department in crisis, often with associated substance misuse.

While there is a growing body of research into lifestyle risk factors associated with increased suicide risk, there is relatively little on the differences in lifestyle behaviours of people who repeatedly self-harm compared to non-repeaters. This is important given the reports of increased mortality and morbidity from a range of natural causes (2,3) in people presenting to Emergency Departments with suicidality. It is also important given the association between increased suicidality and poorer lifestyle behaviours that was documented in our earlier study (34).

The aim of this study was to add to existing data on lifestyle behaviours of suicidal patients, using data from patients attending our Green Card Clinic following presentation to ED with suicidal thoughts or behaviours. They were compared across a range of variables, including demographics, psychiatric diagnoses, DASS scores and various lifestyle factors. The data used in this study were cross-sectional, gathered from patients attending the GCC following their recent presentation to the ED with DSH or SI.

A limitation of this study design is that the data were collected when the patients were distressed and/or depressed and not repeated later. Additionally, this study included only people who actually presented to hospital, thus excluding those who do not present.

Results showed a significant relationship to gender and age, with younger people and females reporting more lifetime episodes of DSH. Higher DASS depression scores were associated with more frequent DSH episodes, rather than clinical diagnosis of depressive or anxiety disorders per se. While clinical diagnosis of SUD was not associated with higher rates of DSH, this diagnosis was strongly related to other health behaviours including smoking, which in turn was related to the outcome, suggesting that there may be an indirect relationship between substance misuse and DSH.

In terms of lifestyle factors explored, there was a significant relationship between the diet and smoking variables and repeated DSH and a nonsignificant trend on all other lifestyle factors, including emotional support, breakfast, drug use, junk food, weight and alcohol. However, using a multiple linear regression model, we demonstrated that balanced meals, current smoking and younger age were the only variables found to be significantly associated with lifetime episodes of DSH. This is an interesting finding as 'eating balanced meals' and smoking were more significant factors for this patient group than questions more routinely asked (such as substance and alcohol use). It is likely that asking about balanced meals is a segue into asking about nutrition in general and the lifestyle checklist also asks about such behaviours as consumption of junk food and breakfast-eating habits. We know from our findings that there is considerable overlap between those who were smokers and those who did not have balanced meals and these two questions may be a proxy for poor lifestyle behaviours in general, and in keeping with the previously reported 'poor health behaviours' component in a factor analysis of the Fantastic Lifestyle Checklist (33).

The importance of diet and nutrition in the assessment and management of patients with suicidal behaviour requires further attention. Given the emerging evidence of the importance of certain elements of a balanced diet, including fruit, vegetables and fish, these dietary elements need to be explored in relation to history of repeated DSH. Lifestyle interventions for suicidal behaviour hold promise because of

their ease of implementation and cost-effectiveness, as well as their known association with depression. They also have the potential to prevent the excessive morbidity and mortality resulting from high rates of physical illness among patients with a history of suicidal behaviour. Indeed, Jacka's group have coined the term 'nutritional psychiatry' to highlight the burgeoning clinical and research interest.

Of note, smoking can change the person's microbiome, with these effects also potentially replicated with e-cigarettes (40), and these changes are thought to impact on weight changes. There is also increasing interest on the bidirectional relationship between medications such as antidepressants and the gut microbiome (41), and how nicotine and other substance use impacts this. It is too early to say how this may impact on mood and suicidality, but these findings demonstrate some potential links worthy of further research.

Having previously argued for importance of asking about smoking (42) in assessment of people presenting with suicidality, we now suggest adding a question about 'balanced meals', as these two questions may provide a simple 'window of opportunity' to identify people presenting with suicidality who are potentially at risk of further mental and physical health problems.

Conclusion

These findings can contribute to a first step in evaluating the impact of interventions relating to such lifestyle interventions as improving diet, exercise, social inclusion, and ceasing smoking and other substances for individuals presenting with suicidality. It also provides an opportunity for more education to patients about the importance of diet, which seems particularly relevant given the high rates of metabolic and cardiovascular disease among patients with a history of DSH (2,3). There is enormous potential to be gained in understanding the impact of lifestyle behaviours on mental health and educating and empowering people to make lifestyle changes, not only to prevent them developing noncommunicable disease, such as diabetes, but also for their emotional wellbeing and sense of agency.

Declarations

Ethics approval and consent to participate

This study was approved by the St Vincent's Human Research Ethics Committee (Reference LNR/13/SVH/374).

Participation was voluntary, and all participants provided written informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

KW and EB drafted the manuscript. TH completed the statistical analyses. All authors read and approved the final version of the manuscript.

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Tables

Table 1.

Sample characteristics and clinical data for the 448 clinic attenders

Characteristic	
Male gender, % (n)	42.9 (192)
Age, Mean (SD)	31.7 (10.6)
Married/Defacto, % (n)	15.9 (71)
Depressive Disorder, % (n)	32.8 (146)
Anxiety Disorder, % (n)	10.8 (48)
Substance Use Disorder, % (n)	19.6 (86)
DASS depression, Mean (SD)	13.2 (5.6)
DASS anxiety, Mean (SD)	9.5 (5.6)
Items from lifestyle measure	
Alcohol >2 drinks/day, % (n)	25.0 (108)
Abuse of prescribed or unprescribed drugs (some of the time or frequently), % (n)	45.3 (198)
Smoker (occasional or daily use), % (n)	59.2 (263)
Hardly ever receive emotional support, % (n)	26.3 (114)
Not within 8kg of ideal weight, % (n)	20.5 (92)
Almost always consume excess sugar, salt, animal fats or junk food, % (n)	15.9 (70)
Hardly ever eat breakfast, % (n)	33.6 (149)
Hardly ever eat balanced meals, % (n)	20.5 (92)
Hardly ever do active exercise for 30mins, % (n)	33.4 (149)

Table 2.

Multiple linear regression model with age, gender, depression and lifestyle variables with lifetime DSH episodes

	Unstandardised beta	Standardised beta	<i>p</i>
Age	-0.03	-0.12	.05
Gender	0.43	0.08	.15
DASS depression	0.01	0.02	.70
Smoker (occasional or daily use)	-0.62	-0.12	.04
Hardly ever receive emotional support	-0.32	-0.06	.32
Not within 8kg of ideal weight	0.12	0.02	.72
Almost always consume excess sugar, salt, animal fats or junk food	0.30	0.04	.47
Hardly ever eat breakfast	-0.02	0.00	.95
Hardly ever eat balanced meals	-0.78	-0.12	.05
Hardly ever do active exercise for 30 mins	-0.01	0.00	.98
Alcohol >2 drinks/day	0.15	0.02	.66