

Suicide after contact with substance misuse services: a national registry study

Martin Ø. Myhre, Anine T. Kildahl and Fredrik A. Walby

Background

People with substance use disorders have a well-known increased risk for taking their own life. Previous research has mainly focused on suicide in mental health services, whereas there is limited knowledge regarding suicide after contact with substance misuse services.

Aims

The aim of the current study was to describe the utilisation of both mental health services and substance misuse services among people who have died by suicide within a year of contact with substance misuse services.

Method

We used an explanatory observational design, where all suicide deaths in the period from 2009 to 2016 were retrieved from the Norwegian Cause of Death Registry and linked with the Norwegian Patient Registry. The people who had been in contact with substance misuse services within a year before their death were included in the sample ($n = 419$). The analysis was stratified by gender, and variables with significant differences between men and women were entered into a multivariate logistic regression model.

Results

More women (73.5%) than men (60.6%) had contact with mental health services in their last year ($P = 0.01$). In the adjusted logistic

regression model, poisoning was more common among women (adjusted odds ratio (AOR) = 1.81, 95% CI 1.09–3.02) and women were more likely to be diagnosed with a sedative, hypnotic or anxiolytic use disorder (F14) in their last year (AOR = 2.77, 95% CI 1.37–5.68).

Conclusions

This study highlights gender differences for suicide in substance misuse services, and the importance of collaboration and cooperation between substance misuse services and mental health services.

Keywords

Suicide; drug use disorders; alcohol use disorders; inpatients; outpatients.

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Suicide is an important cause of mortality and a central contributor to years-of-life lost because of premature death.¹ Although the risk factors for suicide are complex, heterogeneous and still poorly understood, mental disorders are an important risk factor.² This includes substance use disorders (SUDs), which are strongly associated with suicide.³ Previous research has focused on alcohol and opiate use disorders,³ but one recent cohort study found increased risk of suicide in all types of SUDs.⁴ The risk varied according to type of SUD and gender. Other studies have found alcohol- and drug dependence to be a common diagnosis among people dying by suicide during or after contact with mental healthcare services.⁵ Prospective studies have examined suicide mortality after substance misuse treatment, finding an increased risk not only in general,⁶ but also among heroin users,⁷ illicit substance users⁸ and buprenorphine users.⁹ In a national sample of people registered for substance use treatment, Merrall and colleagues¹⁰ found increased suicide rates, with no difference between people with and without opiate use at baseline.

To the best of our knowledge, only two studies have described service utilisation among people in contact with substance misuse services before suicide. In a sample of male veterans who died by suicide with a known SUD, Ilgen et al¹¹ found that 32.8% had received treatment for their substance misuse in the year prior to suicide. A study from Finland using psychological autopsy methods found that among those who died by suicide with a diagnosed SUD, 32.5% had been in contact with substance misuse services sometime during their life.¹² They also found that women utilised psychiatric services to a greater degree than men did, with 67% of women being in contact with mental health services in the last year compared with

37% of men. Although both studies reported a high degree of mental health service utilisation, especially among women, this finding has not been examined further. Although several studies¹³ have described suicide during and after contact with mental health services, suicide after contact with substance misuse services has received little attention. Furthermore, the previous studies have not described service utilisation in-depth, and descriptions of mental health service utilisation are missing. The aim of the current study is therefore to describe contact with both substance misuse services and mental health services among people who died by suicide within a year of contact with substance misuse services.

Method

Sample and design

This study used a cross-sectional observational design. The sample consists of a linkage between the Cause of Death Registry (CDR)¹⁴ and the Norwegian Patient Registry (NPR).¹⁵ First, all suicide deaths (X60–X84; Y10–34; Y87.0; Y87.2) between 1 January 2009 and 31 December 2016 was obtained from the CDR. Then they were linked with data from mental health services and substance misuse services in the NPR using the 11-digit personal identifier. All people who had been in contact with substance misuse services within 1 year of their date of death were included in the final sample ($n = 419$). NPR conducted the data linkage. Service-use history from substance misuse services, mental health services and private mental health practitioners was retrieved for these individuals.

Data sources

The CDR¹⁴ contains information regarding date of death and causes of death in Norway. The registry has a high coverage, with medical information on >98% of deaths.¹⁶ We defined suicide as all those cases where the individual was registered with ICD-10 codes¹⁷ X60–84, Y10–34, Y87.0 or Y87.2 as their underlying cause of death. ICD-10 codes for deaths by undetermined intent (Y10–34, Y87.0, or Y87.2) are rarely used in Norway, and in the current sample, only seven people (1.6%) were registered with a death caused by undetermined intent.

All patient activity in specialist health services in Norway is registered in the NPR,¹⁵ which contains information about the treatment. The registry has included personally identifiable information since 2008, and data from substance misuse services has been registered since 2009. Norway has a large publicly funded healthcare system where mental health services and substance misuse services are accessible at a low deductible fee through referral. Substance misuse services provide all specialised treatment for SUDs including detoxification, out-patient and in-patient services.

Measures

Demographic information and diagnosis

Information about gender, age, date of death and method of suicide were retrieved from the CDR. ICD-10 diagnoses registered at the last direct contact with secondary mental health services or substance misuse services were retrieved from the NPR. Duplicated diagnoses and somatic diagnoses (i.e. not F- or Z-chapter in ICD-10) were disregarded. The diagnoses registered at the last direct episode of contact with services were collapsed into three categories; alcohol use disorders (AUDs, F10), drug use disorders (DUDs, F11–F19) and other mental disorders (F20–F90, F99, Z). We also examined the diagnoses registered for all episodes during the last year before suicide, to see whether each participant in that sample had any of the SUDs (F10–F19) or if they had a diagnosis of mental disorders (F20–F90) in the last year.

Service utilisation

Information regarding service utilisation was retrieved from the NPR and analysed based on three time periods. First, we assessed the last contact, then we examined service utilisation within 90 days and 1 year before suicide. We also established a variable for the patient's contact status at time of death, which was recoded into four levels: (a) discharged from in-patient services as dead, (b) discharged from in-patient services as alive with no out-patient contact before death, (c) last contact as out-patient with open referral and contact within 90 days, and (d) last contact out-patient with closed referral or no contact within 90 days. We examined whether there had been service contact during both the last year and last 90 days before death, and looked at the level of care and type of services that the patient had utilised.

Analyses

Data was analysed with R version 3.4.4.¹⁸ As there are known gender differences regarding both suicide mortality, SUD prevalence and psychiatric comorbidity,¹⁹ the analysis was stratified by gender. Service utilisation was analysed both in general and according to diagnosis registered at last contact. Categorical variables were tested with chi-squared statistics. As the number of days since last contact, number of admissions and number of out-patient contacts were skewed, we reported the median and tested the difference between groups with a non-parametric Mann–Whitney test.

Variables with significant differences between men and women were then entered into a logistic regression model using gender as outcome with men as the reference group. Univariate models

were built before entering all variables in a multivariate model. Since several service utilisation variables were nested within each other, only the most specific variables available were used.

Ethics and approvals

Given that informed consent could not be retrieved, access to the data is provided through an exemption from patient confidentiality granted by the Norwegian Directorate of Health. The Regional Committees for Medical and Health Research Ethics, South-East Norway, approved the project (reference number: 32494).

Results

Description of the sample

We identified 419 people (287 men and 132 women) who died by suicide within 1 year of contact with substance misuse services between 2009 and 2016. This equals 9.2% of all suicide deaths in Norway and 20.7% of all people who died by suicide within 1 year of contact with mental health services or substance misuse services in Norway during the same period. Characteristics of the people in contact with services are shown in Table 1. The men/women ratio was 2.12. Significant gender differences were found regarding method of suicide, which followed the same distribution as the general population. Most men died by hanging or strangulation, whereas poisoning was most frequent among women. AUD was the most prevalent primary diagnosis at last contact for both genders. Opiate use disorder accounted for approximately 38% of the SUDs, followed by sedative and hypnotic use disorders and multiple SUD – both with non-significant gender differences. There was a higher prevalence of multiple SUD among men, whereas sedative, hypnotic or anxiolytic use disorder was more prevalent among women. Of the people with other mental disorders, affective disorders (20.2% men, 31.9% women) was the most prevalent group and psychotic disorders were more frequent among men (24.1%) than among women (12.1%) in this sample.

Service utilisation

Of the 419 people who received treatment in substance misuse services in the last year before suicide, 289 people (69.0%) had their last contact as out-patients in substance misuse services (53.7%) or mental health services (15.3%), respectively (Table 2). A considerable proportion (men, 31.7%, women, 35.7%) had their last contact with mental health services. Few died during an in-patient stay ($n = 16$ (3.8%)). A total of 160 people (38.2%) were terminated out-patients at the time of death. Furthermore, a large, but non-significant ($P = 0.06$) difference was observed in days from last contact to suicide, with women dying sooner after contact (median 14.5) than men (median 30).

As shown in Table 2, service utilisation in the last year before suicide is high with most people receiving services from multiple sectors across both in- and out-patient services. Contact with mental health services in their last year was very prevalent, and during the last year, significantly more women (73.5%) than men (60.6%) had contact with mental health services. The difference was significant for in- and out-patient services, respectively. The number of in-patient admissions was significant for mental health services, where men had a median of one admission compared with women who had a median of two admissions ($P = 0.004$) during the last year. Number of in-patient admissions was non-significant in substance misuse services (men, 1; women, 1, $P = 0.51$). No significant differences were found regarding median number of out-patient contacts in substance misuse services (men, 6; women, 6; $P = 0.24$) or mental health services (men, 5; women, 5; $P = 0.67$).

Table 1 Description of people in contact with substance misuse services before suicide

	Men (n = 287)	Women (n = 132)	P
Age, mean (s.d.)	40.2 (12.8)	41.5 (13.8)	0.35
Method of suicide, n (%)			0.01
Hanging or strangulation	132 (46.0)	43 (32.6)	
Poisoning	80 (27.9)	54 (40.9)	
Other	75 (26.1)	35 (26.5)	
Primary diagnosis at last contact, n (%)			
Alcohol use disorder (F10)	82 (28.6)	37 (28.0)	0.99
Drug use disorder (F11–F15; F19)	101 (35.2)	48 (36.4)	0.90
Opiate use disorder (F11)	38 (37.6)	19 (39.6)	0.96
Sedative, hypnotic, or anxiolytic use disorder (F13)	9 (8.9)	10 (20.8)	0.08
Multiple substance use disorder (F19)	28 (27.7)	11 (22.9)	0.67
Other substance use disorders (F12, F14, F15)	26 (25.7)	8 (16.7)	0.44
Other mental disorders (F20–F90; F99; Z)	104 (36.2)	47 (35.6)	0.98
Affective disorders (F3x)	21 (20.2)	15 (31.9)	0.21
Anxiety disorders (F4x)	11 (10.6)	8 (17.0)	0.45
Other (F2x, F5x, F6x, F9x)	26 (25.0)	10 (21.3)	0.44
Unspecific diagnoses (Zx, F99, no diagnosis)	46 (44.2)	14 (29.8)	0.13
Primary diagnosis during last year, n (%)			
Any mental illness (F20–F90)	101 (35.2)	68 (51.5)	0.00
Any substance use disorder (F10–F19)	241 (84.0)	118 (89.4)	0.19
Alcohol use disorders (F10)	114 (39.7)	55 (41.7)	0.79
Opiate use disorders (F11)	61 (21.3)	23 (17.4)	0.44
Cannabinoid use disorders (F12)	29 (10.1)	7 (5.3)	0.15
Sedative, hypnotic, or anxiolytic use disorder (F13)	17 (5.9)	21 (15.9)	0.00
Central stimulating substance use disorders (F14)	25 (8.7)	13 (9.8)	0.85
Multiple substance use disorders (F19)	64 (22.3)	25 (18.9)	0.51

Table 2 Service utilisation of people in contact with substance misuse services before suicide

	Men (n = 287)	Women (n = 132)	P
Service utilisation at last contact, n (%)			0.11 ^a
In-patient contact in substance misuse services	35 (12.2)	21 (15.9)	
In-patient contact in mental health services	54 (18.8)	20 (15.4)	
Out-patient contact in substance misuse services	161 (56.1)	64 (48.9)	
Out-patient contact in mental health services	37 (12.9)	26 (20.5)	
Contact status, n (%)			0.27 ^a
Missing	14 (4.9)	5 (3.8)	
Current in-patient	10 (3.5)	6 (4.5)	
Discharged from in-patient treatment	78 (27.2)	35 (26.5)	
Ongoing out-patient contact	83 (28.9)	28 (21.2)	
Terminated out-patient contact	102 (35.5)	58 (43.9)	
Days from last contact to suicide, median	30.0	14.5	0.06 ^b
Service utilisation last 90 days, n (%)			
Substance misuse services	180 (62.7)	90 (68.2)	0.33 ^a
Mental health services	120 (41.8)	58 (43.9)	0.76 ^a
Private mental health specialist	6 (2.1)	8 (6.1)	0.07 ^a
In-patient contact	104 (36.2)	61 (46.2)	0.07 ^a
Out-patient contact	202 (70.4)	107 (81.1)	0.03 ^a
In-patient contact in substance misuse services	49 (17.1)	28 (21.2)	0.38 ^a
In-patient contact in mental health services	73 (25.4)	40 (30.3)	0.36 ^a
Out-patient contact in substance misuse services	165 (57.5)	84 (63.6)	0.28 ^a
Out-patient contact in mental health services	73 (25.4)	40 (30.3)	0.36 ^a
Service utilisation during last year, n (%)			
Mental health services	174 (60.6)	97 (73.5)	0.01 ^a
Private mental health specialist	15 (5.2)	13 (9.8)	0.12 ^a
In-patient contact	187 (65.2)	101 (76.5)	0.03 ^a
Out-patient contact	276 (96.2)	130 (98.5)	0.33 ^a
In-patient contact in substance misuse services	111 (38.7)	58 (43.9)	0.36 ^a
In-patient contact in mental health services	130 (45.3)	75 (56.8)	0.03 ^a
Out-patient contact in substance misuse services	264 (92.0)	121 (91.7)	0.99 ^a
Out-patient contact in mental health services	135 (47.0)	83 (62.9)	0.00 ^a

a. Chi-squared test.

b. Mann-Whitney test.

In the logistic regression model comparing women with men, only two variables remained significant in the adjusted model (Table 3). Women were 2.77 (95% CI 1.37–5.68) times more

likely to have received a sedative, hypnotic or anxiolytic use order. Moreover, poisoning 1.81 (95% CI 1.09–3.02) was more common in women than men compared with hanging or strangulation.

Table 3 Differences in characteristics and service utilisation between men (reference) and women

Factors	Unadjusted model		Adjusted model ^a	
	OR (95% CI)	P	OR (95% CI)	P
Method of suicide				
Hanging or strangulation	1 (ref)		1 (ref)	
Poisoning	2.07 (1.28–3.39)	0.003	1.81 (1.09–3.02)	0.02
Other methods	1.43 (0.84–2.43)	0.18	1.28 (0.74–2.20)	0.37
Mental disorder (F20–90) in last year				
No	1 (ref)		1 (ref)	
Yes	1.96 (1.29–2.98)	0.002	1.60 (0.97–2.64)	0.06
Sedative, hypnotic, or anxiolytic use disorder (F14) in last year				
No	1 (ref)		1 (ref)	
Yes	3.00 (1.53–5.98)	0.001	2.77 (1.37–5.68)	0.004
In-patient mental health services in last year				
No	1 (ref)		1 (ref)	
Yes	1.59 (1.05–2.41)	0.03	1.05 (0.63–1.73)	0.09
Out-patient mental health services in last year				
No	1 (ref)		1 (ref)	
Yes	1.91 (1.25–2.92)	0.003	1.54 (0.94–2.55)	0.86

a. Model adjusted for all other variables.

We also analysed differences in service utilisation by last diagnosis (AUD, drug use disorder and mental disorder) between the genders. Among people who received an AUD diagnosis at last contact, women had more out-patient contact in general (men, 63.4%; women, 83.8%, $P=0.04$) and out-patient contact in mental health services (men, 32.9%; women, 54.1%, $P=0.05$) than men. For those who had a drug use disorder at last contact, no significant differences regarding service utilisation were observed. Among people who had a mental disorder, women utilised out-patient mental health services more during the last 90 days (men, 41.3%, women, 63.8%, $P=0.02$) and last year (men, 66.3%, women, 87.2%, $P=0.01$) than men. Women also had more contact with mental health services in general (men, 79.8%, women, 95.7%, $P=0.02$) and in-patient services (men, 68.3, women, 85.1, $P=0.05$).

Discussion

Almost 10% of the people who died by suicide in Norway from 2009 to 2016 had contact with substance misuse services in their last year. Among the different SUDs, AUD was the most prevalent diagnosis, followed by opiate use disorder and use of multiple substances. Almost everyone in the sample had contact with out-patient services in their last year, and a large proportion had been admitted to in-patient care. Concurrent contact with mental health services in their last year was common and observed among 64.6% of the people in the sample. Women in contact with substance misuse services more often had mental health disorders and had more in- or out-patient contact with mental health services in the year before death than men.

Findings in the context of previous research

Studies have found that people with SUDs generally have low utilisation of services. For example, Rhee & Rosenheck²⁰ found that only 17.3% of adults with opioid use disorder used any drug-related health service, and 4% of people with AUD had received AUD treatment.²¹ The high prevalence of contact with substance misuse services could be because of selection bias since the current study only included people who died by suicide. People who die by suicide with a SUD or AUD may for instance have experienced more problems with suicidality or other mental

health disorders, and will thus be more likely to have been in contact with services than people with a SUD who have not died by suicide.

People who take their own life after contact with substance misuse services utilised the whole range of services available in mental health services, and many had contact with several different levels of care and types of services. Most people received out-patient services at their last contact, and almost the entire sample had out-patient contact during the past year. Even though few died by suicide as in-patients, most of the sample had received in-patient services during the last year before death – either in substance misuse services or in mental health services. As a result of this large heterogeneity of service utilisation across in- and out-patient services across both substance misuse services and mental health services, suicide preventive efforts do need to focus on the entire system and not restrict its efforts to discrete areas of the services.

Although the increased risk of suicide after discharge from in-patient mental health services is well-known,¹¹ the current study found a clear tendency for people with a SUD to die by suicide shortly after contact with substance misuse services or mental health services. This has also previously been found after discharge from substance misuse services.²² In addition, women died sooner after last contact than men. Discharge from both in- and out-patient services should thus be regarded as a high-risk period for suicide.

Contact with both in-patient and out-patient services with mental health services was highly prevalent. Previous studies^{11,12} have found a large degree of mental health service contact, but detailed descriptions of the contact have been lacking. Contact across different services could indicate comorbidity, as we also found a large degree of mental health disorders, especially depression and anxiety disorders in the subgroups. In addition, the target group for mental health services and substance misuse services are overlapping and especially challenging when both the SUD and mental health disorders are severe. To the best of our knowledge, the current study is the first to replicate this finding in a comprehensive national sample, and this should be a key area to examine further.

The current study found important gender differences regarding the prevalence of suicide after contact with substance misuse services. The men/women ratio was 2.12, which is similar to the men/women ratio reported in a recent meta-analysis of people in contact with mental health services.¹³ Few significant differences

between men and women were found on individual characteristics, but differences were observed in their degree of service utilisation in their last year. Women utilised both in- and out-patient services more than men did, a result that was significant for contact in the last year. Higher utilisation of services are consistent with several studies on both SUD¹⁹ and service utilisation in general.²³ The services examined in this study could, however, already have significant differences in contact rates between the genders – meaning that there might be a tendency for women to receive treatment in traditional mental healthcare services whereas more men receive treatment in substance misuse services. This may not accurately reflect the underlying comorbidity, but could indicate that health professionals pay more attention to symptoms of other mental health disorders in women.

Both mental health disorders and sedative, hypnotic or anxiolytic use disorder was more prevalent in women than men, but only sedative, hypnotic or anxiolytic use disorder remained significant in the adjusted model. Previous studies have also found high hazard ratios for suicide mortality, and higher hazard ratios in women than men.⁴ The association could indicate severe anxiety over time, which dispose towards a sedative, hypnotic or anxiolytic use disorder. It should, however, be noted that few people had a sedative, hypnotic or anxiolytic use disorder in their last year before suicide in this study.

We found no differences in service utilisation among people who had an AUD, drug use disorder or mental health disorder at last contact. This result should, however, be carefully considered. In women especially, the subsamples have limited power. Moreover, heterogeneity between the discrete types of SUDs could mask important variation, as previous studies have found differences in service utilisation according to different types of substance use.⁴ Lack of information regarding prior suicidal behaviour is a variable that potentially outweighs the importance of type of SUD and could explain the lack of difference, since Mojtabai and colleagues²⁴ found that suicidal behaviour was strongly associated with perceived need for help among people with SUD. Lastly, it could be that substance use severity is a more important mediator of suicide risk than type of substance use. Both the use of controls and increased sample sizes to examine each type of SUD could contribute to elaborate this finding.

We found that hanging was the most prevalent cause of death in men, whereas poisoning was most prevalent in women. The difference remained significant in the adjusted model where women were twice as likely to die by poisoning. These distributions follow the same pattern as in the general population.²⁵ Classification of suicide deaths involve considerations regarding the act's intent. Even though the suicide statistics in the CDR are of good quality,²⁶ it is especially challenging to determine intent regarding poisoning. This is particularly the case for groups that use lethal substances such as opiates. As a result, some suicide deaths are classified as accidental overdoses when they should have been classified as suicides.²⁷ Moreover, the possibility of diagnosing the cause of these deaths is challenging because the intent can be unclear or fluctuating.

The increased risk for suicide among people with comorbid mental disorders and SUDs are well-known.^{2,28} The relationship between SUDs and mental health disorders is both complex and bidirectional, however, the current study found that affective disorder was the most common mental disorder. Nevertheless, the prevalence of comorbid disorders found in this study was surprisingly low; bearing in mind that high comorbidity between SUDs and mental health disorders is well-known.²⁹ We thus believe the estimates of comorbid mental health disorders in this study should be regarded as an underestimate. This finding might be because of underdiagnosed and underreported comorbid conditions

in administrative registry data compared with structured diagnostic assessments, but might also reflect a lack of diagnostic and therapeutic focus on comorbid mental health conditions in substance misuse services. If so, this might indicate areas for improvement in services in general, and when it comes to suicide prevention in these services.

Limitations

A limitation of the current study is the uncontrolled observational design without a control group, which leaves us unable to examine differences between the patients who died by suicide after contact with services and the patients who are alive after contact. Furthermore, accidental overdoses are not included in this sample and the number of suicide deaths should thus be regarded as an underestimation of the total number of suicides. In addition, the registries lack valuable information about substance use – such as age at onset, intravenous drug use and drop-out from treatment among others – and previous suicidal behavior, which future studies should aim to address.

It is unclear to what degree the findings in this study – from a rich country with a large, accessible and publicly funded healthcare system – can be generalised to other populations. This applies particularly to the proportions in contact with, and utilisation of, both substance misuse services and mental health services.

Implications

Even though SUD is a well-recognised risk factor for suicide, contact with substance misuse services before suicide has received little attention. A strength of the current study is the national sample including all suicide deaths among people who had contact with substance misuse services in the year before suicide. Moreover, the study includes registry-based information regarding service utilisation in both substance misuse services and mental health services in the last year, which made it possible to analyse overlapping use of services in substance misuse and mental health.

Mental health disorders and utilisation of both substance misuse services and mental health services is prevalent. Cooperation, coordination and integrated treatment of substance use and mental health disorders is important in both substance misuse services and mental health services. More systematic assessment and treatment of comorbid mental health conditions in substance misuse services is an implication of our findings that should be examined in future studies. Previous studies have found that a dual-diagnosis policy³⁰ has reduced suicide rates in mental health services and that reducing alcohol and drug misuse is of clinical importance.⁵ Suicide prevention efforts in specialised services should not be restricted to mental health services, but also include services with overlapping areas. More knowledge about suicide among people in contact with substance misuse services is needed.

Martin Ø. Myhre , MSc, National Centre for Suicide Research and Prevention, University of Oslo, Norway; **Anine T. Kildahl**, MSc, National Centre for Suicide Research and Prevention, University of Oslo, Norway; **Fredrik A. Walby**, PsyD, National Centre for Suicide Research and Prevention, University of Oslo, Norway

Correspondence: Martin Ø. Myhre. Email: m.o.myhre@medisin.uio.no

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Data availability

All authors had access to the study data. Data is not publicly available as the individuals are indirectly identifiable.

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Data was retrieved from the Norwegian Patient Registry and the Norwegian Cause of Death Registry. The interpretation and reporting of these data are the sole responsibility of the authors.

Author contributions

M.Ø.M., A.T.K. and F.A.W. formulated the research questions, designed the study and contributed to the final manuscript. M.Ø.M. analysed the data and wrote the first draft.

Declaration of interest

None.

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