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Mortality characteristics in Sudan in national psychiatric hospitals: 5-year review of hospital mortality

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Abstract

Background: Re-auditing mortality of inpatient psychiatric service for a span of time extending to 14 years is scarce in low-resource countries. We are reporting a 5-year mortality study to complete an audit cycle with a previous 9-year mortality research published a few years ago. It serves to improve the standard of care in low-resource settings.

Results: Out of a total of 7340 (4890 men and 2450 women) admissions to all national psychiatric hospitals in Khartoum over a 5-year period, 36 (23 men and 13 women) patients died while receiving inpatient psychiatric treatment. The mortality rate in this sample was 4.9 (4.7 for men and 5.3 for women). Among all deaths, 30.6% were diagnosed with schizophrenia, while mania constituted 25%, major depression 15% and organic psychosis 11.3%, and 11.1% were considered to be due to alcohol- and/or drug-related disorders. There was no single case of unnatural death in this sample.

Twenty patients (55.6%) died following circulatory failure (sudden death), four (11.1%) as a result of an infection, three (8.3%) from renal failure, two (5.6%) secondarily to NMS, two (5.6%) from diabetic complications and four patients as a result of ECT, GIT bleeding, ischaemic heart disease and alcohol complications.

Conclusion: Circulatory failure and infection are the main causes of death in psychiatric hospitals in Sudan, calling for an intense investigation to resolve these preventable problems.

Keywords: Mortality, Psychiatric hospital, Sudden death, Arrhythmias, Sudan

Background

Mortality studies on inpatient psychiatric services have brought to light important issues regarding service assessments and patient management issues. It is well accepted in all settings that patients with mental illness are subjected to relatively high risks of mortality culminating in earlier loss of life with 10–20 years of potential life lost (YPLL) [1, 2]. This is due to multiple medical co-morbid conditions, such as a high tendency to develop metabolic syndrome leading to higher risks of cardiovascular accidents (CVAs), diabetes, hypertension

and stroke [3, 4]. Obviously, the picture is complicated by an elevated ratio of a sedentary lifestyle, excessive smoking and a lack of physical activity, which are more representative of mentally ill patients [5, 6]. Moreover, these problems are exacerbated by psychotropic medication side effects (such as weight gain, sedation, electro-physiological disturbances and tiredness), and patients with mental illness are less likely to seek early medical help, and hence, many silent diseases (including cancers) may well appear at a late stage [7].

Researchers and clinicians have long emphasized the seriousness of physical co-morbidities that mentally ill individuals present with, such as diabetes, lung disease, liver conditions and cardiovascular diseases, including hypertension and coronary heart disease (CHD) [8, 9]. A

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recent publication from Australia reported that physical co-morbidity in people with schizophrenia accounts for 60% of premature deaths not related to suicide in this population [10]. On the other hand, mentally ill patients are at risk of suffering the consequences of inherent features of their illnesses, such as a lack of motivation, self-neglect, apathy, cognitive impairments, drug and/or alcohol problems, homelessness and poverty, resulting in malnutrition, vitamin deficiency, liver and lung diseases, and risks of infection [11, 12].

Therefore, depending on patients' medical setting, these problems predispose them to a variety of serious illnesses leading to death. European researchers and reports from Japan have confirmed that the incidence of pulmonary thromboembolism (PTE) is extremely high among patients receiving antipsychotic drugs, including clozapine [13, 14]. Researchers from Western countries, the USA among them, have reported that PTE is commonly found among patients treated with either conventional antipsychotic drugs or second-generation antipsychotics (SGAs), including clozapine, and that this may be due to hormonal adverse effects of antipsychotic drugs, for instance, hyperprolactinaemia [15, 16]. The risk of weight gain induced by medication is also increased by some antipsychotic drugs. They also increase the risk of associated metabolic abnormalities, such as dyslipidaemia, diabetes and hyperglycaemia [17]. In fact, research has revealed that causes directly linked to mental illness, such as suicide and homicide, constitute the least direct assailants [18]. More often, causes of mortality in mental illness are either directly linked to psychotropic medication as side effects, e.g. arrhythmias and neuroleptic malignant syndrome (NMS), or as a consequence of long-term use of medications, as with metabolic syndrome [19].

In developing countries, the story regarding mortality causes is rather different, as infections, malnutrition and circulatory failure have been found to be the leading causes for both in inpatient and outpatient settings [20–22]. It has also been consistently found that individuals with severe mental disorders (SMDs) are more likely to die of preventable illnesses, such as malaria, tuberculosis, diarrhoea, malnutrition, HIV and sepsis [23, 24]. A recent mortality study from Sudan highlighted the possible link between potent first-generation antipsychotics (FGAs) and sudden death (often, these drugs are given parenterally in large doses without close ECG monitoring) [22]. Other inpatient mortality causes include NMS, diabetic ketoacidosis, alcoholic liver disease, cardiovascular accidents, respiratory diseases (pulmonary embolism, choking and asthma) and suicide [25, 26].

Researchers from different continents have highlighted the potential risks of arrhythmias from the use of antipsychotics with potent cholinergic effects that would

likely cause prolongation of the QT interval leading to torsade de pointes (TdP) phenomenon and ventricular fibrillation [27, 28]. Arrhythmias are more likely to occur if drug-induced QTc prolongation coexists with other risk factors, such as individual susceptibility, the presence of congenital long QT syndrome low potassium, heart failure, bradycardia and electrolyte imbalance [29]. It is believed that women are more susceptible than men to ventricular fibrillation due to prolonged QT interval, old age, hepatic or renal impairment, and restraint [30].

Manu et al. [31] asserted that from their 26-year inpatient mortality study, the most frequently recorded cause of death among their sample was sudden death from natural causes. They speculated that the most likely cause could be due to the impact of antipsychotics on myocardial repolarization, leading to prolongation of the QTc interval on an electrocardiogram, culminating in ventricular fibrillation [31]. Some psychotropics have been said to carry substantial risks of increasing QTc, including haloperidol, phenothiazine, quetiapine, venlafaxine, fluoxetine, citalopram (including escitalopram) and methadone [32, 33]. Sudden, otherwise unexplained deaths are commonly due to ventricular fibrillation arising as a consequence of coronary artery disease. Nonetheless, the determination of the cause of sudden and unexpected death is seldom easy, especially in retrospective mortality studies [31, 33].

Methods

This is the second audit of mortality in the national psychiatric hospitals in Khartoum, the capital of Sudan. The first study reported on 9-year mortality that occurred before the year 2010. Findings were disseminated to a wide audience in the medical community, including international conferences, seminars and teaching forums, as well as publishing a manuscript in a reputable journal [22]. This is a re-audit of mortality for the period from January 2011 to end of December 2015, in the light of lessons learnt from the previous study. The audit team collated and thoroughly examined records of all deceased patients subsequent to the first audit representing the current study period. There are five main psychiatric hospitals in the capital city of Sudan conventionally known as national psychiatric hospital on view of the population they serve and accessibility of their service provision. Although most patients using the services of these five hospitals came from Khartoum and nearby regions, a considerable number of patients come from all different regions of the country. Eltigani Elmahi Teaching Hospital and Baashar Teaching Hospital are the biggest psychiatric hospitals in Sudan. The former is a prominent centre in Africa and the Middle East. Both cater for a population of six million besides receiving referrals from surrounding provinces. Both hospitals are

served by 25 senior psychiatrists, 23 psychiatric registrars, 18 resident medical doctors, 45 psychologists, 30 social workers and 120 nurses.

The other three hospitals were Omdurman Military Hospital, Khartoum Teaching Hospital Psychiatric Unit and Abdelaal Psychiatric Hospital (a forensic hospital with medium secure facilities). They were staffed by 16 psychiatrists, 26 psychologists, 14 social workers and 22 training and resident doctors.

The research team designed an Audit Master sheet, to include comprehensive entries of mortality risk factors. This included socio-demographic information, source of referrals, psychiatric and medical diagnoses, medical treatments, form and types of psychotropic medications, route of administration and timing of administration in relation to death. Moreover, the cardiovascular state of deceased patients was recorded at critical points. Vital symptoms and investigations indicative of organic illnesses or side effect of drugs were also included.

The audit was based on a comprehensive evaluation of mortality correlates so that gaps in the present quality of care could be identified. Moreover, we examined the persistence or otherwise of risk factors, characteristics of mortality and the extent of application of any lessons learnt from the previous mortality report.

All deceased patients' records linked with the cohort team were easily identified from the hospital records of the five national psychiatric hospitals in the capital city of Sudan, Khartoum.

Data collection

Data were collected for the audit through a comprehensive assessment of deceased patients' case notes. The audit was supervised by a senior researcher, three consultants and a research coordinator. Socio-demographic information was extracted from clinical records, along with periods spent as an inpatient before death. Data about antipsychotic medications administered to patients, together with recorded doses, timing and reported outcomes, were noted. All medical and psychiatric symptoms, clinical characteristics, diagnoses and medical investigations were recorded on the audit master sheet. Each case was examined by two members of the research team and approved by the senior researcher. Records of in-house mortality audits were examined by the research team.

Data analysis

Data were analysed using SPSS version 22.0 to generate descriptive and quantitative statistical measurements. Frequencies and number of deaths were measured, using the chi-square test, along with *p* values for significant correlates. Additionally, the death rate was also calculated along with the frequency and percentage of psychotropic drugs administered to patients at the national

psychiatric hospitals. The percentage of cardiovascular-related conditions was calculated as well as frequencies of important correlates.

Results

Out of 7340 admissions over a 5-year period, 36 patients died while receiving treatment in one of the five national psychiatric hospitals in Khartoum. The death rate was 4.9/1000 admissions at a rate of 7.2 deaths per year. Men constituted two-thirds of the deceased patients equal to their admission ratio. The mean age of deceased individuals was 42.1 ± 9.8 sd (standard deviation). Most of the deceased patients ($n = 24$, 66.7%) died in the first week of their stay in the hospital, despite the length of their psychiatric illness (evenly distributed).

Psychiatric and organic diagnosis

A third ($n = 11$, 30.6%) of the deceased individuals had a diagnosis of schizophrenia, nine (25%) patients were diagnosed with bipolar affective disorder, manic episode and five (13.9%) with major depression, while three (8.3%) met the criteria for drug-induced psychosis, three (8.3%) for organic psychosis, one for alcohol dependence, one for postpartum psychosis and one for dementia.

Although two-thirds (66.6%) of the deceased individuals had shown no clear evidence of organic illnesses, four (11.1%) had evidence of infection (malaria, typhoid), three (8.3%) were suffering from renal failure, two (5.6%) had diabetic complications and the same number died as a result of NMS. One patient died from ECT complications (due to ventricular arrhythmia on a background of electrolyte imbalance with high potassium), one following GIT bleeding and one due to alcohol complications. There were no suicides or unnatural deaths (Table 1).

Cause of death

While 16 patients (44.4%) had an apparent cause of death, the majority ($n = 20$, 55.6%) had no apparent cause of death and were thought to have deteriorated suddenly; hence, a label of "circulatory failure" was given. Two patients (5.2%) died following NMS and four (11.1%) due to infection (Table 2).

Prescribed psychiatric treatment

Most of the deceased individuals had received a combination of haloperidol ($n = 25$) and promethazine ($n = 25$), either in injectable intramuscular or in oral form, in the last 48 h before death. Eleven were on diazepam, seven patients were taking olanzapine, five were on sertraline and six were prescribed sodium valproate. Citalopram and lorazepam were each prescribed for two patients. The following drugs were each prescribed for only one individual: carbamazepine, risperidone, quetiapine and clomipramine (Table 2 and Fig. 1).

Table 1 Mortality characteristics

Characteristic				Characteristic	No.	%
Age	Gender		<i>n</i>	Psychiatric diagnosis		
	Male	Female				
≥ 30	7	4	11	Schizophrenia	11	30.6
30–50	7	4	11	Mania	9	25.0
51–70	7	4	11	Depression	5	13.9
70 +	2	1	3	Organic psychosis	3	8.3
Total	23	13	36	Alcohol related	1	2.8
Length of stay in hospital before death						
	No.	%				
≤ 1 week	24	66.7		Drug-induced psychosis	3	8.3
1–4	7	19.4		Postpartum psychosis	1	2.8
1–6 months	3	8.3		Dementia	1	2.8
> 6	2	5.6		Total	36	100
Duration of illness						
	No.	%				
≥ 6 months	14	38.9		Associated physical illness		
6–12 months	4	11.1		Malaria or typhoid	4	11.1
1–5 years	8	22.2		Acutely ill no diagnosis	8	22.2
≥ 5	10	27.8		No physical illness	21	58.3
Total	36	100		No information	3	8.3
				Total	36	100
				Source of referral		
				Family	28	77.8
				Psychiatrists	5	13.9
				Others	3	8.3

Discussion

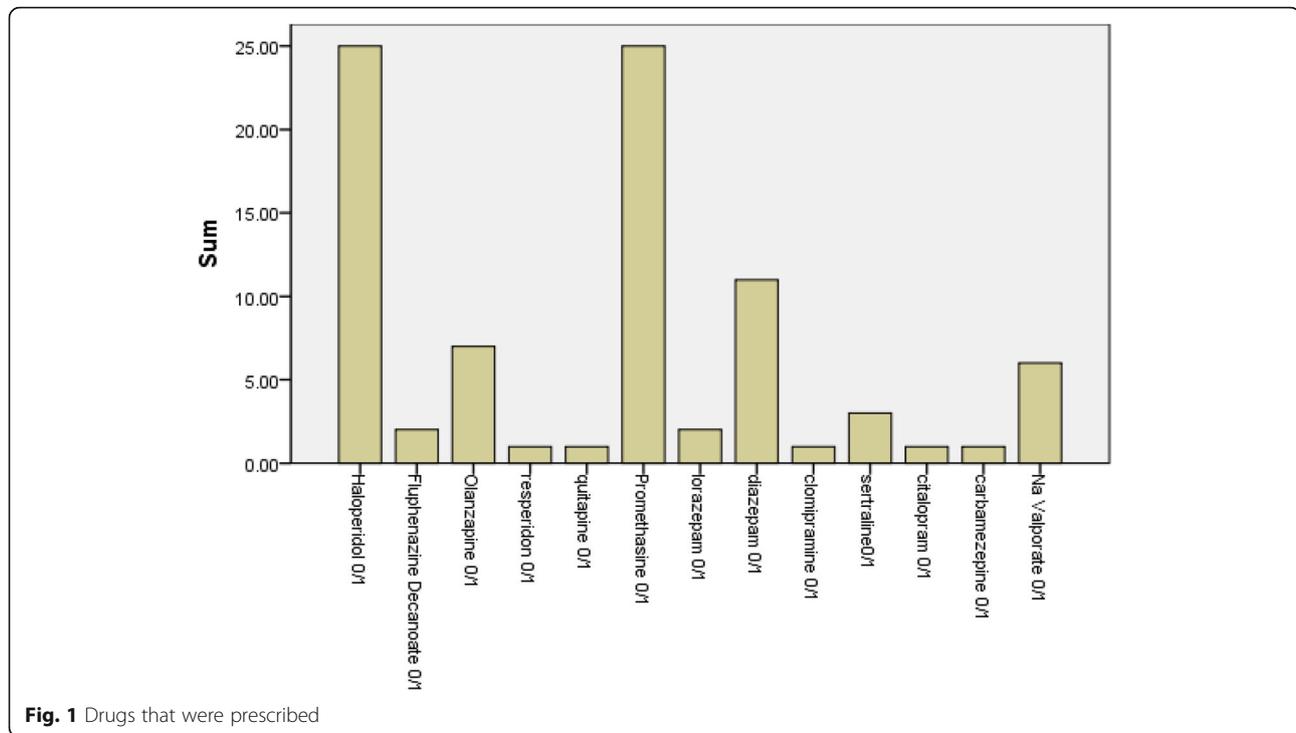
The mortality rate (MR) for the inpatient psychiatric service in Sudan was 36/7340, giving rise to a mortality rate of 5.2/1000 and 7.2/year. The age range for this sample was 23–72 years, and the mean age was 42.3 (sd ± 19.3)

years, with 21.5 potential years of life lost (PYLL) [34]. The male to female ratio was 1.98. These figures mirror many studies from high- and low-income countries.

Schizophrenia represented almost one-third (30.6%) of patients' diagnoses, mania 25%, major depression 9%,

Table 2 Causes of mortality and psychiatric drug treatment before death

Cause of death	No.	100%	Drugs used for the psychiatric disorder before death	No. of pts	Mean dose/day mg	Route
Circulatory failure unknown	20	55.6	Haloperidol	25	12 ± 5 sd	IM + oral
Cardiovascular ischaemic heart disease	1	2.8	Promethazine	25	100 ± 25 sd	IM + oral
			Diazepam	11	15 ± 5	
Respiratory	1	2.8	Olanzapine	7	15 ± 5	Oral
Drug related (NMS)	2	5.6	Sodium Valproate	6	1500 ± 250	Oral
ECT complication	1	2.8	Sertraline	5	150	Oral
			Citalopram	2	40	
Suicide	0	0	Fluphenazine decanoate	2	200	IM
GIT bleeding	1	2.8	Risperidone	1		Oral
Infection (malaria, typhoid and sepsis)	4	11.1	Quetiapine	1		Oral
Diabetes/hypoglycaemia	2	5.6	Clomipramine	1	100 ± 25	Oral
Renal failure	3	8.3	Carbamazepine	1	800	Oral
Alcohol complication	1	2.8	Lorazepam	2	4 ± 2	Oral
Total	36	100				



alcohol- and/or drug-related disorders 11.1% and organic psychosis 8.3%. Similar diagnostic categories have been quoted in India, South Africa and Brazil [34–37].

Causes of mortality

Although 45% of the deceased individuals had a clear cause assigned to their death certificate, 55.6% of the patients deteriorated suddenly, and hence, circulatory failure was noted as their cause of death. This raises the question of the extent to which psychiatric treatment was involved in the causation of this category. Similar results were found by Manu and Correll in their 26-year inpatient mortality analysis in a New York psychiatric hospital [31]. The possibility of ventricular fibrillation due to TdP was previously raised in the earlier study, especially as there was no ECG documentation regarding this deterioration to preclude such a query [22], and over two-thirds of patients (69.4%) were receiving a combination of haloperidol and promethazine (both in an injectable and oral form), with mean doses of 12 mg 5 sd and 75 mg 50 sd, respectively, shortly prior to death (Table 2). Both of these drugs are known to increase QT interval, with potential risks of ventricular fibrillation [27, 28, 32]. Compared to the previous mortality study in the same hospitals, it seems that this high contribution of circulatory failure has not improved, since there was no change in the main treatment regime of cheap medication with potential quinidine-like effects has continued to be used, due to limited financial resources in developing countries. As there was no definite

evidence of ECGs being recorded shortly prior to death in deceased records, this link remains speculative and should be explored in future studies. On the other hand, antipsychotic medications (FGAs and SGAs) were shown to have a sudden cardiac death ratio of 2.39 compared to non-users [24, 26, 37–40].

Of note in this study is that organic psychosis and NMS have lessened in frequency (8.3% and 5.6%, respectively), compared with the previous mortality study in the same hospitals. On the other hand, deaths due to diabetic complications (5.6%) and renal failure (8.6%) remain high, which raises the question of whether these patients were in the right medical setting.

In line with studies in low-income countries, infections (especially malaria and septicemia) constitute a significant cause of mortality in psychiatric patients [20–22, 36]. Two-thirds of deceased patients were diagnosed with psychosis, predominantly schizophrenia and organic psychosis (triggered by tropical infection, leading to a sub-acute confusion state with hallucinations and delusions). Cases of organic psychosis sometimes pass through the medical filter to find its way to psychiatric wards, despite warnings from the previous audit results [22, 37].

Over two-thirds (66.7%) of the deceased died in the first week following admission to hospital, a period that can be considered critical for patients. An earlier study indicated that about 80% of patients died within 2 weeks of hospitalization. Two-thirds of the deceased were young men under the age of 40. This concurs with reports from many developing countries [22, 34, 35].

It is worth stressing here that there were no unnatural deaths in this study such as suicide or accidental death. This is for multifactorial reasons. The model of inpatient care in Sudan may be a contributory factor, as the admission policy insists that a family member stays with the patient during the treatment process for safety reasons, but also the model of care is a partnership between the hospital and the patient's family. A similar policy has been reported in other low-income countries [22, 34, 35].

In keeping with previous findings 5 years earlier, a shortage of trained staff; a lack or short supply of emergency medicine, ECG monitoring and unconditional laboratory support; and a lack of core medical skills on the part of trained medical doctors played a role in the high hospital mortality rate [22, 34, 40].

Limitations

The most important limitation of this study is that being retrospective, it has a record-based design, which relies on the data in charts. However, since death is a significant event recorded in any hospital, detailed records and monitoring of events prior to death are essential for any determination of causal factors, and as such, highlighted associations are only speculative and deductive. Nonetheless, valuable lessons can be learnt.

Due to the lack of cause-specific reference data of mortality in the country, we could not calculate a cause-specific SMR.

Conclusions

Together with the first mortality study, this study provides a complete audit cycle, with a view to improving patient care and setting future directions for enhancing psychiatric services. Imparting initial audit recommendations from the first study helped to tighten up admission policy, resulting in a reduction in the number of cases of acute confusion state being admitted to psychiatric hospitals in the second study. It also helped to reduce the number of unnatural deaths and improved suicide risk assessment. However, hospital managers in developing countries are strongly advised to make ECG machines readily available for staff to closely monitor patients on psychotropic medications, especially during the first week following admission, as this is seen as a critical period of care when two-thirds of deaths take place, and as many patients also require parenteral treatment. All medical staff should be trained to use portable ECG machines and read ECGs. Psychiatric hospitals in developing countries should always receive liaison input from medical internists in terms of caring for critically ill patients and offering advice on organic disorders.

Abbreviations

SMR: Standard mortality rate; TdP: Torsade de pointes; QTc: Corrected QT interval; ECG: Electrocardiogram; SMD: Severe mental disorder; YPLL: Years of potential life lost

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Authors' contributions

AO and I.H made substantial contributions to the conception of the study, and KA, M.E and L.E were responsible for the data acquisition. AHO and I.H were responsible for analysing the data. All authors contributed to the study design and interpretation of the data. A.O drafted the article. All authors provided critical revisions regarding important intellectual content and approved the final version.

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Availability of data and materials

The dataset used and analysed in this research is available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was reviewed and approved by Khartoum Medical School's ethics committee. Written permissions were obtained from all hospital administrations that took part in the study. All patients have patient identity number, which is easily traceable via medical record departments based in each hospital. As this research was conducted on deceased patients' records, the ethics committee waived the need for written informed consent to be obtained from the next of kin. No patient details were mentioned in the article.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interest.

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