Child and Adolescent Mental Health Services in Khartoum State, Sudan:

A desktop situational analysis

By

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DECLARATION

I, Khalid Abdallah Abdalhai, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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This research is based on data gathered during the M.Phil. training period in child and adolescent psychiatry at the Division of Child and Adolescent Psychiatry (DCAP), Red Cross War Memorial Children's Hospital, University of Cape Town.

The protocol for this dissertation was presented and reviewed firstly in the DCAP and then presented and reviewed by the Department of Psychiatry and Mental Health in August 2020. The Faculty of Health Sciences Human Research Ethics Committee at the University of Cape Town approved the study protocol (HREC Reference: HREC026/2022).

The research did not receive funding from any institution, and all the work was done independently by the research team.

Authors' contributions

KA – Conceptualised the idea, led protocol development, data analysis, and interpretation, and drafted and prepared the manuscript.

SM – Contributed to the conceptualization of the idea, led data collection, and contributed to protocol development, data analysis and interpretation, and drafting of the manuscript.

PJdV – Contributed to the conceptualization of the idea, protocol development, data interpretation, and drafting and revision of the manuscript.

All authors read and approved the final manuscript.

ABSTRACT

Background

Sudan is a Northeast African country, with 61.7% of its population under 24 years. Data concerning child and adolescent mental health (CAMH) is limited in low-income countries. With a large youth population and significant cultural and linguistic diversity, Sudan has contributed minimal data to global CAMH research.

Objectives

This study aimed to perform a desktop situational analysis of CAMH services in Khartoum state, Sudan.

Methods

In chapter 1, we performed a literature review of peer-reviewed publications on PubMed and Google scholar and identified relevant articles through search terms relevant to the focus of the study. In chapter 2, we performed a desktop situational analysis of the national capital of Sudan, Khartoum state, in the calendar years 2019 and 2020. The study used the World Health Organization Assessment Instrument for Mental Health Systems version 2.2 adapted for CAMH. The study covered the six WHO-AIMS domains: 1) policy and legislation, 2) CAMH services, 3) CAMH in primary health care, 4) human resources for CAMH, 5) public education, and 6) monitoring and research. Data sources were identified, and relevant information and documents were reviewed. The data were described in tables and figures using the WHO-AIMS version 2.2 template. Ethical approval was obtained from the Human Research Ethics Committee at the Faculty of Health Sciences, University of Cape Town.

Results

The desktop situational analysis found no available policy legislation specific to CAMH in Khartoum and no separate budget for CAMH. There was no supervising body for CAMH services in Khartoum. Three mental health tertiary hospitals were found to provide services for children and adolescents with mental health problems, all together with adult mental health services. Essential medicines were available in all facilities, except methylphenidate (a stimulant medication used for ADHD), available only in 3 central pharmacies. At the primary care level, there were limited data about training offered to primary healthcare providers and about the process of referral to specialized CAMH services. A School Mental Health Program (SMHP) existed, which provided services for school-aged children and helped in the early identification and management of CAMH problems. The workforce was small and variable across all levels of care. There was no formal public health awareness campaign identified in Khartoum during the study period and little evidence of formal intersectoral collaboration on CAMHS. A health information system existed in Khartoum, but no CAMH-specific items were reported. No national studies in CAMH were identified.

Conclusion

This situational analysis represented the first systematic collation of data and information about CAMH services in one of the Sudan states. Findings highlighted some areas of strength, but also many gaps in CAMH services and systems. We acknowledge the need to complement the desktop analysis with in-depth data collection with stakeholders across multiple levels, but hope that this will serve as a first step towards strengthening CAMH services in Khartoum and beyond.

KEYWORDS

Child, adolescent, mental health, situational analysis, primary healthcare, school mental health.

DEFINITION OF TERMS

Children and adolescents: The United Nations Convention on the Child's Rights defines a child as "a human being below the age of 18 years unless, under the law applicable to the child, the majority is attained earlier" [1].

LIST OF ABBREVIATIONS

CAMH: Child and Adolescent Mental Health

EMR: Eastern Mediterranean Region

FMOH: Federal Ministry of Health

LMICs: Low- and Middle-Income Countries

PHC: Primary Health Care

UNDESA: United Nations Department of Economic and Social Affairs

UNFPA: United Nations Population Fund

UNICEF: United Nations Children's Fund

WHO: World Health Organization

WHO-AIMS: World Health Organization Assessment Instrument for Mental Health Systems

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Chapter One: Introduction and Literature Review

1. Introduction

1.1 Background

Mental health is a key component of health. However, data concerning child and adolescent mental health (CAMH) has predominantly come from high-income countries (HIC). In contrast, with a large youth population and significant cultural and linguistic diversity, the African region has contributed minimal data to global CAMH research [2, 3]. Nevertheless, there is a growing awareness of the importance of child and adolescent mental health, which has shaped global health initiatives over the past two decades. A recent systematic review and meta-analysis showed considerable mental health problems among children and adolescents in sub-Saharan Africa (SSA), with 19.8% positive on screening tools, 14.3% meeting criteria for one or more psychopathology, and 9.5% diagnosed with clinical diagnostic instruments [4]. Despite these facts, CAMH services on the African continent are still underdeveloped, and CAMH research is highly lacking [3, 5-8]. In a study conducted by Davis and colleagues about CAMH in Africa, which included neighbouring countries to Sudan, they identified important gaps in CAMH-related policies, community participation, CAMH institutions and, interpersonal communication in relation to CAMH [9]. In response to the shortage of CAMH professionals, programmes have been promoted to fill some gaps, such as the World Health Organization (WHO) Mental Health Gap (mhGAP) training programme, to emphasise the importance of facilitating the strengths, and overcoming mental health barriers. Many strategies can be utilized to improve access to mental health care,

including increasing the number and capacity of healthcare providers who can deliver preventive and treatment services. Strategies also include engaging family members and improving the mental health promotion and treatment capacity of care providers, especially at the primary health care (PHC) level [10].

The WHO developed a framework to guide the evaluation and strengthening of mental health services which can be applied to CAMH services (See Figure 1.1). The framework highlights that tertiary and specialist services are costly and needed by only a small portion of the population, while informal, community-based and primary health care services can be provided at a relatively low cost and are needed by a large proportion of the population [11]. The framework includes:

- Informal and community-based services, which are provided by peers, parents, school staff and influential community members. The informal settings play an important role in sensitizing the community toward mental health issues and promoting mental health
- Formal services which include primary care services, specialized community or psychiatric services based in the general hospitals, and specialized and long-stay services

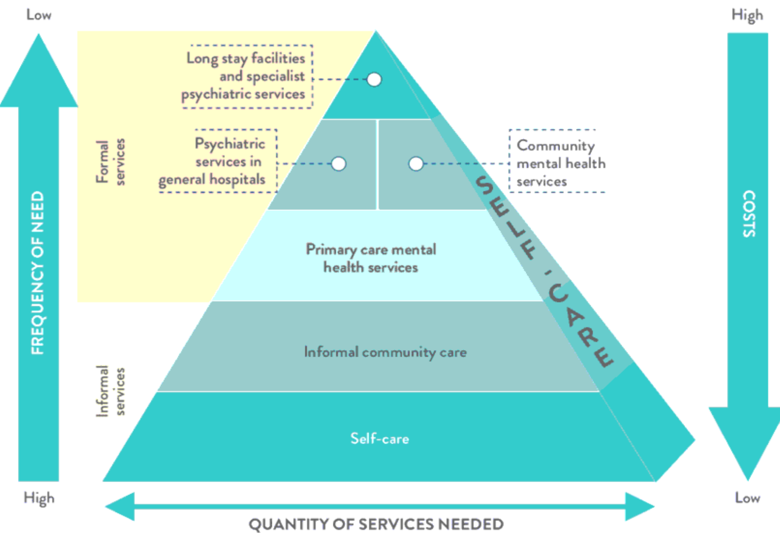

Figure 1.1. WHO Service Organization Pyramid for an Optimal Mix of Services for Mental Health [11].

1.2 Health, mental health, and child & adolescent mental health in Sudan and Khartoum State

Sudan, in the Northeast part of Africa, is bordered by seven countries - Egypt, Eritrea, Ethiopia, South Sudan, Central African Republic, Chad, and Libya (see Figure 1.2). The country occupies 1.8 million km^2 and has an estimated population of 38.6 million, of which 61.7% are under the age of 24 years [12]. It is unique and complex in its climate, politics, environment, languages, cultures, religion, and ethnicities [13]. Sudan consists of 18 states (provinces), with Khartoum as the capital state [14]. Khartoum state has an area of 22,000 km^{2,} and by 2005, official estimates put the population of the capital city at 4.5 million, although unofficial estimates suggest a population of over 7 million [15]. The people of Khartoum reflect Sudan's various ethnic, geographical, and social backgrounds. As shown in figure 1.3, Khartoum state is divided into seven

localities (Khartoum, Jabal Awliya, Omdurman, Ombada, Karary, Bahry, and Sharq Enil).

Figure 1.2. Sudan and its bordering countries (copied from Encyclopaedia Britannica, 2021) [15].

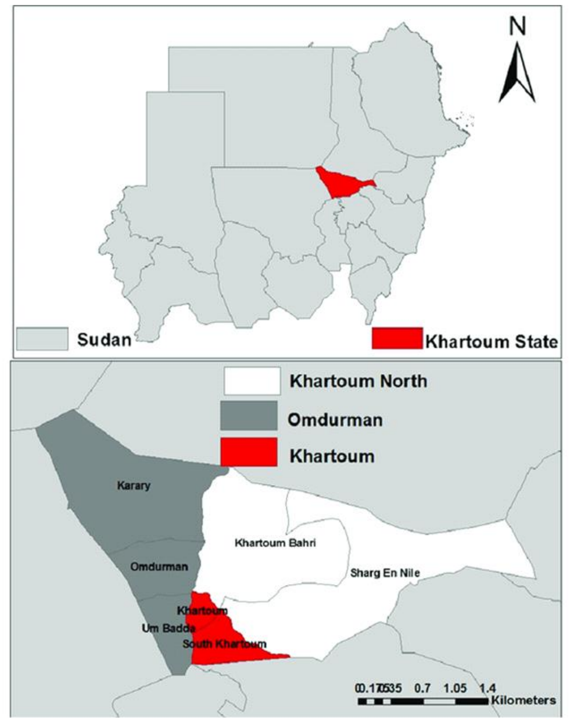

Figure 1.3. A map showing Khartoum State with its localities [16].

Recent United Nations Population Fund data showed that about 39.5% of Sudanese people are between 0 to 14 years [13]. The same data reported that the life expectancy at birth is 64 years for males and 68 years for females. The literacy rate is 70.8% for men and 49.1% for women [12]. Many factors (e.g., poverty, natural disasters, wars, displacement) impact the health and nutritional status of the Sudan population, which increases the vulnerability to diseases. The World Bank categorizes Sudan as a low-income country [17], and it is grouped as part of the Eastern Mediterranean Region (EMRO) by the WHO.

In December 2019, the people's revolution against the Sudan government succeeded in changing the governing regime. Since then, Sudan has been under a transitional government composed of joint military and civilian rule. While the current government is trying to reform the healthcare system, several barriers have existed, including the worldwide COVID-19 pandemic [18].

The health system in Sudan is managed at three levels: federal (one Federal Ministry of Health), state (18 states Ministries of Health), and district/ locality levels. The focus of these levels ranges from health policies and strategic planning to services implementation, management, and prevention. The health services in Sudan are provided by governmental (e.g. Federal and State Ministries of Health, Military and Police Medical Services, and Governmental Universities), and Non-Governmental bodies (e.g., Non-governmental organizations, private universities, and the private health sector) [19].

The number of physicians in the population in different states of Sudan varies. According to the WHO, 4.45 doctors, nurses, and midwives per 1,000 population indicate the minimum density of a workforce that is fit for purpose to attain the targets of the Sustainable Development Goals [20]. As reported in the WHO atlas of mental health, the absolute number of workers per 100,000 population varies enormously, from 11.9 psychiatrists per 100,000 population in high-income countries to fewer than 0.1 in low-income countries. In the same report, the number of general psychiatrists in Sudan was reported to be 0.08 per 100,000, and the number of child psychiatrists was 0.01 per 100,000 [21]. Based on a recent review, the total number of psychiatrists in Sudan was estimated to be around 70 to 80 [22], the majority of which work in the capital state (Khartoum), with only thirteen psychiatrists working in other states. The CAMH services are located only in Khartoum and Gezira states (both are middle states in Sudan). Within the Khartoum state, the CAMH services are present at all health service levels [22].

In 2018, Global Burden of Disease data showed that the burden from mental and substance use disorders, measured in Disability Adjusted Life Years (DALYs), has steadily risen in the Eastern Mediterranean Region over the last three decades and is higher than the global average in almost all EMRO countries [23]. However, in Sudan, in the absence of a national epidemiological study on mental health problems, it is difficult to estimate the prevalence of mental health problems in different age groups and determine the actual burden of mental health disorders.

A handful of publications about mental health in Sudan have to date contributed to the limited picture of the landscape of needs and available resources. Osman and colleagues [22, 24] presented a review of mental health in Sudan and described that mental health services were mainly centralized in Khartoum, resulting in people from urban areas having better access to inpatient and outpatient mental health services. Out of the 18 federal states, only 12 had fully equipped psychiatric hospitals run by qualified consultant psychiatrists. The other six states were either managed by non-specialist medical doctors, clinical psychologists, or medical assistants (allied health workers who receive basic medical training to support the work of physicians and other health professionals, usually in a clinic setting [25]. The country has six psychiatric hospitals, all in the Khartoum state. Two of these hospitals provide specialist forensic and addiction services. Osman and colleagues commented that young doctors often leave the country for better jobs or to further their careers and ambitions. Even though two-thirds of Sudan's population lives in rural areas, a small proportion of psychiatrists work in rural areas [22].

The Sudan Mental Health Policy was published with the support of the WHO in 2009, with the following components: 1) development of a mental health component in primary healthcare, 2) scaling up human resources, 3) the involvement of patients and their families, 4) strengthening advocacy, 5) promotion of the human rights protection of patients, 6) equity and access to mental healthcare services across different groups, 7) quality improvement, 8) financing and 9) establishing monitoring systems [26, 27].

Postgraduate training in psychiatry is overseen by the Sudan Medical Specialization Board (SMSB), established in 1995 to produce highly qualified medical specialists and subspecialists. The four-year training programme in general psychiatry includes training in different specialities in psychiatry plus a 3-months rotation in neurology and internal medicine. In addition, all candidates should spend four to six months on child and adolescent psychiatry training during the training period, focusing on outpatient cases. While the country has witnessed a significant increase in the number of mental health profession schools over the past two decades, until 2019, 178 graduates have become specialists in psychiatry, 75% of whom have since emigrated, primarily to work in the Gulf States [24]. Unfortunately, there are no available preliminary data regarding the number of psychologists, psychiatric nurses, and social workers in postgraduate programmes [28].

In the context of the limited knowledge-base about mental health and psychiatric services in Sudan, child & adolescent psychiatry and mental health knowledge are even more limited. To our knowledge, there is no national study on CAMH in Sudan and few data-containing publications on CAMH in the country. In one study, the prevalence of depression and anxiety among school-age children was reported to be 12% [29]. In a study of adolescents in a correctional facility in Khartoum state, psychiatric disorders were reported to be high (60%), with conduct disorder the most common (47.9%), followed by anxiety disorders (31.1%) and major depressive disorder (14.6%) (30). The WHO reported an all-ages suicide rate of 8.1. per 100 000 in Sudan [31], but unfortunately, these data were not disaggregated to show suicide rates for under-18-year-

olds. It is clear that these limited data provide snapshots from different and potentially biased samples, thus making it very difficult to have an accurate and data-driven picture of the mental health needs of children and adolescents in the country.

Based on a meta-analysis of CAMH disorders that show up to 20% of the full range of child & adolescent psychopathologies globally [32], Sudan would (at a conservative estimate of a 10% prevalence) have ~2.38 million children, adolescents, and young adults under the age of 24 with a diagnosable and treatable mental health disorder. However, despite these very high numbers indicating very significant levels of need for CAMH services and systems of care in the country, almost nothing is known about the basic building blocks and components of CAMH systems in Sudan. In order to identify strategies to strengthen services and health systems for children and adolescents with mental health problems in the country, it is therefore of fundamental importance to generate a basic situational analysis of CAMH in the country.

1.3 The building blocks of mental health systems

The WHO defines the health system as " all the organizations, institutions, resources and people whose primary purpose is to improve health" [33]. As shown in figure 1.4, building blocks in the health (including mental health) system are structured into six core components that cover: (i) service delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential medicines, (v) financing, and (vi) leadership/governance (33). Therefore, a comprehensive evaluation of a health system requires focusing on all the domains mentioned above.

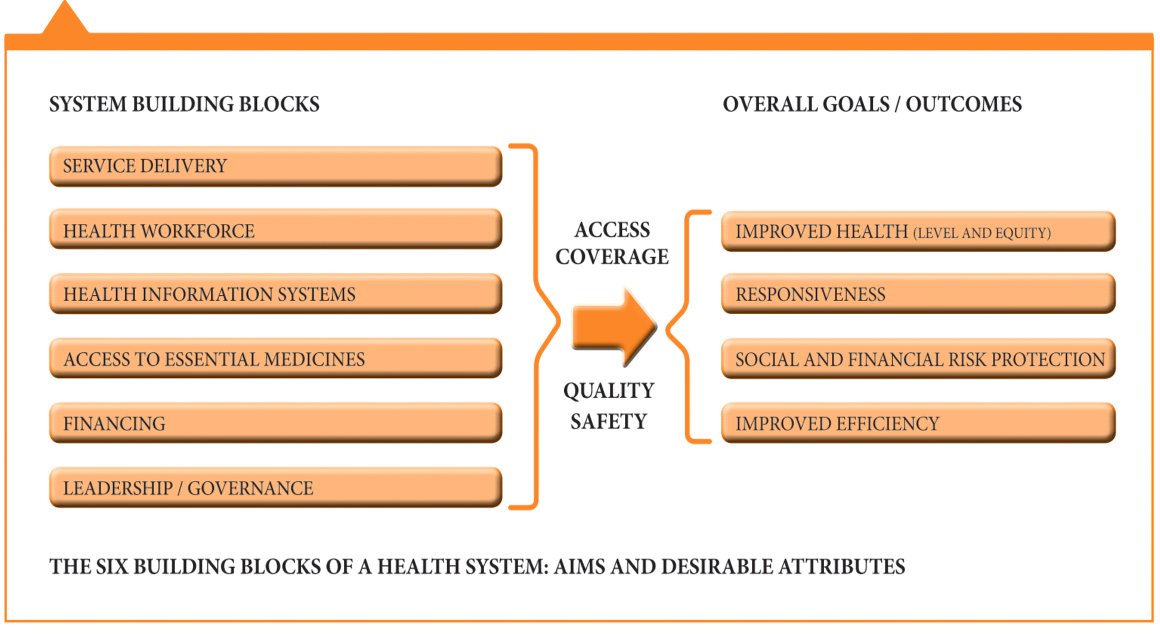

Figure 1.4. The WHO Health Systems Framework [33].

The World Health Organization Assessment Instrument for Mental Health Systems (WHO-AIMS) was designed to collect essential information on the mental health system in low- and middle-income countries [34]. It covers six core domains which are in line with the building blocks of the health system: 1) policy and legislative framework, 2) mental health services, 3) mental health in primary health care, 4) human resources, 5) public education and links with other sectors, and 6) monitoring and research. The WHO-AIMS instrument was constructed to show a clear picture of threats and opportunities of mental health systems in countries to support countries and regions to strengthen their mental health systems and mental health policy implementation.

1.4 Performing a situational analysis in the health sector

The WHO defines a situational analysis in the health sector as "an assessment of the current health situation … [that] is fundamental to designing and updating national policies, strategies and plans" [34]. There are many other definitions for situational analysis, but they share the same concepts. The situational analysis in the health sector is an ongoing process and aims to 1) assess the current health sector situation, including strengths, weaknesses, opportunities and threats, 2) provide evidence for responding to health sector needs and expectations of the population, and 3) provide evidence for formulating future strategic plans for the health sector [35].

2. The Study Aims and Objectives

2.1 Aims

This study aimed to establish a broad and systematic baseline profile of child and adolescent mental health services and systems in the Khartoum State of Sudan.

2.2 Objectives

In order to support the overarching aim of the study, a situational analysis was conducted. Given the limited scope of this thesis (a minor dissertation), a decision was made to perform a desktop analysis rather than a broader multi-level, mixed-method situational analysis. In line with the building blocks of health systems as outlined by the WHO (2010) [33], the situational analysis set out to describe:

- Availability of CAMH policies, legislation, and strategic plans, either separately or as a part of general mental health policy

- Financing of CAMHS
- Leadership and governance of CAMH services
- Existence and organization of CAMH services (inpatient and outpatient services, commonly reported cases, identification sites, and referral pathways)
- Availability of essential psychotropic medications and psychosocial interventions
- Availability of CAMH services at the primary care level, including types of illnesses, interventions, and prevention strategies
- Human resources for CAMH services
- Published research on CAMH in Sudan over the most recent ten-year period

3. Conclusion

This literature review chapter sought to describe the broad landscape of mental health and CAMH in Sudan to contextualize the systematic situational analysis described in chapter 2. In addition, we outlined the WHO building blocks of health systems and described the basic principles of a situational analysis. The review identified that the health system in the country was not clearly described in the literature. The literature also revealed a significant gap in knowledge regarding CAMH in Sudan.

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Chapter Two: Publication-ready Manuscript

Child and Adolescent Mental Health Services in Khartoum State, Sudan: A desktop situational analysis

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Abstract

Background

Sudan is a Northeast African country, with 61.7% of its population under 24 years. With a large youth population and significant cultural and linguistic diversity, Sudan, like most low-income countries, has contributed minimal data to global child and adolescent mental health (CAMH) research. This study aimed to perform a desktop situational analysis of CAMH services and systems in Khartoum State, Sudan.

Methods

The study focused on Khartoum state and covered the calendar years 2019 and 2020. Using the World Health Organization Assessment Instrument for Mental Health Systems (WHO-AIMS) version 2.2 adapted for CAMH, the study focused on the publicly available data sources. Findings were described and presented in tables and figures using the WHO-AIMS template.

Results

The situational analysis found no CAMH-specific policies, no separate budget for CAMH, and no supervising body for CAMH services in Khartoum. Three tertiary mental health hospitals provided CAMH services, combined with adult mental health services. Essential medicines were available in all facilities, except methylphenidate, available only in 3 central pharmacies. No free access to essential psychotropic drugs for children and adolescents except in emergency settings. Data about training to primary healthcare providers and the process of referral to specialized services were limited. A School Mental Health Program (SMHP) existed which provided early identification and management of CAMH problems in schools. The workforce was small and variable

across all levels of care. No formal public health awareness campaigns and little evidence of formal intersectoral collaboration on CAMH were identified. A health information system existed, but no CAMH-specific items were reported. Among a handful of publications on CAMH, no national studies on CAMH were identified.

Conclusion

This situational analysis represented the first systematic collation of data and information about CAMH in Sudan. Findings highlighted some areas of strength, but also many gaps in CAMH services and systems. We acknowledge the need to complement the desktop analysis with in-depth data collection with stakeholders across multiple levels, but hope that this will serve as a first step towards strengthening CAMH services in Sudan and other low-income countries.

Keywords:

Child, Adolescent, Mental Health, Situational Analysis, Khartoum, Sudan.

Background

Mental health is a key component of health. Unfortunately, data concerning child and adolescent mental health (CAMH) in the African region, with a large youth population and significant cultural and linguistic diversity, has contributed very limited data to global CAMH research [1,2]. Nevertheless, there is a growing awareness of the importance of child and adolescent mental health, which has shaped global health initiatives over the past two decades [3]. A recent systematic review and meta-analysis showed considerable mental health problems among children and adolescents in sub-Saharan Africa (SSA), with 19.8% positive on screening tools, 14.3% meeting criteria for one or more psychopathology, and 9.5% diagnosed with clinical diagnostic instruments [4]. Despite these facts, CAMH services on the African continent are still underdeveloped, and CAMH research is highly lacking [2, 5-8]. In a study conducted by Davis and colleagues about CAMH in Africa, which included neighbouring countries to Sudan, they identified important gaps in CAMH-related policies, community participation, CAMH institutions and, interpersonal communication in relation to CAMH [9].

The WHO developed a framework to guide the evaluation and strengthening of mental health services applied to CAMH services. The framework highlighted that tertiary and specialist services are costly and needed by only a small portion of the population, while informal, community-based, and primary health care services can be provided at a relatively low cost and are needed by a large proportion of the population [10].

Sudan is a low-income African country in the Northeast part of Africa, bordered by seven countries - Egypt, Eritrea, Ethiopia, South Sudan, Central African Republic, Chad, and Libya. It occupies 1.8 million km^2 and has an estimated population of 38.6 million, of which 61.7% are under the age of 24 years [11]. Recent United Nations Population Fund data showed that about 39.5% of Sudanese people are between 0 to 14 years [12]. Sudan consists of 18 states (provinces), with Khartoum as the capital state [13], with an area of 22,000 km^2 and by 2005, official estimates put the population of the capital city at 4.5 million, although unofficial estimates suggest a population over 7 million [14]. Khartoum state is divided into seven localities (Khartoum, Jabal Awliya, Omdurman, Ombada, Karary, Bahry, and Sharq Enil).

The mental health system in Sudan

The governmental health system in Sudan is managed at three levels: federal (one Federal Ministry of Health), state (18 states Ministries of Health), and district/ locality levels. The focus of these levels ranges from health policies and strategic planning to services implementation, management, and prevention [15]. As reported in the WHO Atlas of Mental Health, the absolute number of workers per 100,000 population varies enormously, from 11.9 psychiatrists per 100,000 population in high-income countries to fewer than 0.1 in low-income countries (see Simelane & de Vries, 2021 for a visual summary of findings) [8]. In the same report, the number of general psychiatrists in Sudan was 0.08 per 100 000, and the number of child psychiatrists was 0.01 per 100 000 [16]. Osman and his colleagues estimated the number of psychiatrists in Sudan to be

around 70 to 80 [17]; the majority (60-70) of them work in Khartoum state. The CAMH services are located only in Khartoum and Gezira states (both are middle states in Sudan). Within the Khartoum state, the CAMH services are present at all health service levels [17, 18].

In the absence of a national epidemiological study on mental health problems, it is difficult to estimate the prevalence of mental health problems in different age groups and determine the actual burden of mental health disorders.

The Sudan Mental Health Policy [19] was published with the support of the WHO in 2009, with the following components: 1) development of a mental health component in primary healthcare, 2) scaling up human resources, 3) the involvement of patients and their families, 4) strengthening advocacy, 5) promotion of the human rights protection of patients, 6) equity and access to mental healthcare services across different groups, 7) quality improvement, 8) financing and 9) establishing monitoring systems [20].

Postgraduate training in psychiatry is overseen by the Sudan Medical Specialization Board (SMSB), established in 1995 to produce highly qualified medical specialists and subspecialists. The four-year training programme in general psychiatry includes training in different specialities in psychiatry plus a 3-months rotation in neurology and internal medicine. In addition, all candidates should spend four to six months on child and adolescent psychiatry training during the training period, focusing on outpatient cases. While the country has witnessed a significant increase in the number of the mental health

profession, over the past two decades, until 2019, 178 graduates have become specialists in psychiatry, 75% of whom have since emigrated, primarily to work in the Gulf States [18]. Unfortunately, there are no available preliminary data regarding the number of psychologists, psychiatric nurses, and social workers in postgraduate programmes [21].

In the context of the limited knowledge-base about mental health and psychiatric services in Sudan, child & adolescent psychiatry and mental health knowledge are even more limited. To our knowledge, there is no national study on CAMH in Sudan and few data-containing publications on CAMH in the country. In one study, the prevalence of depression and anxiety among school-age children was reported to be 12% [22]. In a study of adolescents in a correctional facility in Khartoum state, psychiatric disorders were reported to be high (60%), with conduct disorder the most common (47.9%), followed by anxiety disorders (31.1%) and major depressive disorder (14.6%) [23]. The WHO reported an all-ages suicide rate of 8.1. per 100 000 in Sudan [24], but unfortunately, these data were not disaggregated to show suicide rates for under-18-year-olds. It is clear that these limited data provide snapshots from different and potentially biased samples, thus making it very difficult to have an accurate and data-driven picture of the mental health needs of children and adolescents in the country.

Based on a meta-analysis of CAMH disorders that show up to 20% of the full range of child & adolescent psychopathologies globally [25], Sudan would (at a conservative estimate of a 10% prevalence) have ~2.38 million children, adolescents and young adults under the age of 24 with a diagnosable and treatable mental health disorder. However,

despite these very high numbers indicating very significant levels of need for CAMH services and systems of care in the country, almost nothing is known about the basic building blocks and components of CAMH systems in Sudan.

Situational analysis of CAMH services and systems

The WHO defined situational analysis in the health sector as "an assessment of the current health situation … [that] is fundamental to designing and updating national policies, strategies, and plans" [26]. There are many other definitions for situational analysis, but they share the same concepts. The situational analysis in the health sector is an ongoing process. It aims to 1) assess the current health sector situation, including strengths, weaknesses, opportunities, and threats, 2) provide evidence for responding to health sector needs and expectations of the population, and 3) provide evidence for formulating future strategic plans for the health sector [27].

The WHO defined health systems as " all the organizations, institutions, resources and people whose primary purpose is to improve health" [28]. The WHO proposed six building blocks that can also be applied to mental health: (i) service delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential medicines, (v) financing, and (vi) leadership/governance [28, 29]. Therefore, a comprehensive evaluation of a health system requires focusing on all the domains mentioned above.

Given the limited knowledge about CAMH services and systems in Sudan, this study, therefore, set out to perform a desktop situational analysis of CAMH services in Khartoum state, Sudan.

Methods

Study design

This was a desktop cross-sectional descriptive situational analysis performed using a modified version of the World Health Organization Assessment Instrument for Mental Health Systems (WHO-AIMS) version 2.2 of 2005, to collect data from the CAMH service. This modified version adapted from the WHO-AIMS is, to our knowledge, the only published assessment tool for situational analysis of CAMH services.

The context and boundaries of the study

The study was performed in the national capital of Sudan, Khartoum state, and focused on a period of 24 months (from the 1st of January 2019 to the 31st of December 2020). This period was selected because it represented a transition between the previous governing regime and the current transitional government.

Data collection

The Brief version of the World Health Organization Assessment Instrument of Mental Health Systems (WHO-AIMS, version 2.2 of 2005) was used for data collection. As outlined by Mokitimi and colleagues [7], the WHO-AIMS was designed for general mental health systems, and only one CAMH-related item was included in the original

tool. Mokitimi and colleagues adapted the WHO-AIMS for CAMH data collection by a) selecting relevant items from the tool and b) adapting the descriptions to be CAMH-specific. We, therefore, opted to use the Mokitimi adaptation for data collection here [7]. Items selected for this study are shown in Table 2.1. The information about individual data items shown in the table 2.1, were collected through using publically available data, and the gaps were filled by direct communication with relevant data sources. The researcher engaged with key stakeholders telephonically and by email to obtain information to fill in the gaps, and to verify the information already obtained.

Table 2.1. Items selected for the desktop situational analysis of CAMH services in the Khartoum State, Sudan [7], and potential data sources.

WHO-AIMS Domains	Potential Data Sources
1. Policy and legislative framework	
1.1 CAMH Policies, plans, and legislations (B1, B3, B4) 1.2 Human rights legislation relevant to children and adolescents (B5) 1.3. Financing: Expenditure on child and adolescent mental health services by the Provincial Department of Health (B6)	-The head of the Mental Health Council in the Federal Ministry of Health -Child and Family Law -The Mental Health Act of Sudan - The finance division at the Khartoum Ministry of Health
2. Child and adolescent mental health services	
2.1. Existence and functions of a regional CAMH authority (B9) 2.2. Organization of CAMHS in terms of catchment areas (B10) 2.3. Outpatient services: Availability of CAMH outpatient facilities, and number/proportion of children and adolescents treated for mental health problems through outpatient facilities at primary, secondary, and tertiary levels of care (B11, B12, B13) 2.4. Inpatient services: Availability of CAMH inpatient facilities and number/proportion of children and	-The Hospital Directorate in Khartoum state Ministry of Health - The Directorate of Therapeutic Medicine in Khartoum state Ministry of Health - The Directorate of Preventive Medicine in Khartoum state Ministry of Health - The head of the Psychiatry Consultancy Board in the Federal Ministry of Health -Psychiatric Hospital Directors -Sudan National Essential Medicines List 2014 (or more recent versions if available)

adolescents treated (B15, B16, B17) 2.5. Availability of CAMH day patient facilities, community residential facilities, forensic facilities, or CAMH hospitals (B14, B18, B19, B25) 2.6. Interventions (Medications): Psychotropic medicines appropriate for children and adolescents are included on the essential medicines list, free access to essential psychotropic medicines, and availability of medicines in outpatient and inpatient settings at secondary and tertiary levels of care (B2, B8, B28, B29) 2.7. Interventions (Psychosocial): Access to psychosocial interventions in outpatient and inpatient settings at secondary and tertiary levels of care (B26, B27)	
3. Child and adolescent mental health in primary healthcare (PHC)	
3.1. Refresher training in CAMH provided to primary health care (PHC) doctors, nurses or other staff and interaction of PHC with specialist CAMHS (B31-B35) 3.2. Availability of medicines and psychosocial interventions in PHC facilities (B27, B33)	-The Directorate of Primary Health Care, Khartoum state Ministry of Health - Director of the School Mental Health Programme at Khartoum state Ministry of Health -Sudan National Essential Medicines List 2017
4. Human resources	
4.1. Human resources in CAMH services (B38-B41)	- Human resources section, Khartoum State Ministry of Health -Hospital Directors
5. Public education and links with other sectors	
5.1. Public education and awareness campaigns about CAMH (B47)	-Khartoum state Ministry of Health, Directorate of Health Education and Awareness -WHO office of Sudan
6. Monitoring and research	
6.1. Monitoring CAMH services (B52, B53)	Directorate of Hospitals, Khartoum State Ministry of Health
- Data transmission from mental health facilities (B52) -Report on mental health services by the government health department (B53)	The Head of the Psychiatry Consultancy Board in the Federal Ministry of Health

6.2. Research in CAMH (B54)	-Sudan Medical Specialization Board - University of Khartoum library - Online search for peer-reviewed publications.

* The numbered letters (e.g., B1, B2, B3….etc.) represent the item codes for subdomains from the original brief version of the WHO-AIMS 2.2.

Data analysis

Data were analysed using simple descriptive statistics supported by the WHO-AIMS version 2.2 of the 2005 template and presented in tables and figures with a relevant description of each domain.

Research ethics

The study protocol was approved by the Faculty of Health Sciences at the University of Cape Town (HREC026/2022).

Results

The desktop situational analysis findings using the adapted variables from the WHO-AIMS (as shown in table 2.1) are presented here. Results are presented by domain using the WHO-AIMS summary template [30].

WHO-AIMS Domain 1: Policy and legislative framework

We could not identify any CAMH policy, legislation, or plans at the national or state level [19]. The Sudan National Mental Health Policy was last revised in 2009 in collaboration with the WHO and covered the following components: 1) development of

mental health services in primary healthcare, 2) scaling up human resources es, 3) involvement of patients and their families, 4) strengthening advocacy, 5) promotion of the human rights protection of patients, 6) equity and access to mental healthcare services across different groups, 7) quality improvement, 8) financing and 9) establishing monitoring systems [20]. The policy was developed by a committee that included representatives from different Sudanese universities, Federal and States Ministries of Health, and the Ministry of Social Affairs. There were no stand-alone or CAMH-specific policies or plans identified; however, in the Sudan Mental Health Policy, CAMH was mentioned under specialized programmes that need to be developed together with addiction and old age psychiatry. Despite the absence of legislation specific to CAMH, the Children’s Act (2010), released by the National Council for Child Welfare under the supervision of the Ministry of Justice in 2010, represented legislation relevant to children under the age of 18 years and laid the foundation for child protection and welfare in Sudan. The act was considered important legislation that addressed the issues of children's need for protection, care, safety, and justice; and defined the child and the age of criminal responsibility. The act did not specify how these concepts should be applied [31].

Despite the human rights domain being mentioned in the Sudan Mental Health Policy [19], no human rights review body existed in Sudan during this situational analysis. At the country level, the Psychiatry Consultancy Board (PCB), a body consisting of senior mental health professionals in the county and directly related to the Sudanese Federal Ministry of Health, provided advice to the government related to human rights,

legislation, service coordination, and planning. However, the PCB was not involved in any executive decision-making [Personal communication, Dr Salah Haroun, Previous head of the PCB, 29 Nov 2021]. In Khartoum, there was no reported review or inspection of the human rights protection of children and adolescents during the situational analysis period, either in mental health facilities or in community-based services. Furthermore, we found no evidence that mental hospital staff or staff working in inpatient psychiatric units or community residential facilities had received teaching or training sessions on the human rights protection of patients during the study period [Personal communication, Medical directors of the psychiatric facilities in Khartoum, 13 December 2021].

The situational analysis was not able to identify any data related to the financing of mental health or CAMH in Khartoum. About 6.5% of Sudan's Gross Domestic Product (% GDP) and 8.2% of the general government expenditure on health in general. The out-of-pocket share was about 70% (US$84.0 per capita), while the general government health expenditure represents only 22.3% (US$26.9 per capita) [32].

WHO-AIMS Domain 2: Child and adolescent mental health services

As outlined under domain one, a PCB existed at Federal Level, but no health authority in the country was devoted to overseeing CAMH. In practice, the directors of the psychiatric hospitals functioned as leading authorities for mental health in their facilities [Personal communication, Previous head of the PCB, Dr Salah Haroun, 29 Nov 2021]. However, these facilities typically did not include many children and adolescent mental health specialists.

The mental health service provision in Khartoum state was under the umbrella of the directorates of curative medicine [19]. Theoretically, mental health services in Khartoum were organized in terms of geographical (i.e., catchment areas) service areas. However, the structure was strongly centralized [18]. Khartoum state was divided into three major cities, Khartoum, Omdurman, and Bahri. Each city was further divided into localities, with a total of seven localities in the whole Khartoum state.

We were unable to find any publicly available data about CAMH services in Khartoum. However, on the ground, CAMH services were available in three tertiary mental and paediatrics health facilities in Khartoum, distributed in two cities of Khartoum state (2 in Omdurman, 1 in Bahari). The first service was a weekly outpatient service for children with mental health problems established as a package of care through the Department of Paediatrics at the Military hospital in 1998 and supervised by a child psychiatrist. The second service was also an outpatient and inpatient service for children and adolescents with mental health problems based in a Taha Baashar psychiatric hospital in Bahri, established in 2011 and supervised by a child psychiatrist. Inpatient care for children was provided in an adult mental health ward. The third service for children and adolescents with mental health problems was in the Alzahra centre (a Child and mother unit) in the Eltigani Elmahi Psychiatric hospital in Omdurman. This centre provided outpatient (3 days per week) and inpatient services for children and adolescents with mental health problems (in a separate two-bed ward). The centre was established in 2015 and was supervised by a general psychiatrist interested in childhood psychiatric disorders.

According to data from health facilities that ran CAMH services, 980 children and adolescents were seen during the study period from January 2019 to December 2020. Out of all children and adolescents treated as outpatients in these facilities, 27.55% (N= 270) were female. Further details are shown in table 2.2.

Table 2.2. The number and percentage of children and adolescents seen at the different mental health outpatient facilities during the study period in Khartoum state.

Outpatient Facility		Jan - December 2019	Jan – December 2020
The Military Hospital	Total number	276	87
	Gender	Females = 80 (28.98%)	Females = 23 (26.43%)
		Males = 169 (71.02%)	Males = 64 (73.57%)
Taha Baashar Hospital	Total number	92	77
	Gender	Females = 43 (46.73%)	Females = 34 (44.15%)
		Males = 49 (53.27%)	Males = 43 (55.85%)
El Tigani Elmahi Hospital (Alzahra Centre)	Total number	218	138
	Gender	Females = 76 (34.68%)	Females = 23 (16.66%)
		Males = 142 (65.32%)	Males = 115 (83.34%)

The data from the tertiary facilities that provided CAMH services revealed the most frequently diagnosed disorders (from the most to the least frequent) in the outpatient clinics of Khartoum during the study period were: 1) unspecified psychological and behavioural conditions, 2) intellectual disability, 3) epilepsy, 4) attention deficit hyperactivity disorder, 5) schizophrenia and related psychotic disorders, 6) autism spectrum disorder, and 7) disruptive behaviour disorders. These diagnoses were based on the outpatient facilities registry in the three hospitals that provided mental disorders

services for children and adolescents. The average number of hospital/clinic contacts per user was not available. There was no organized follow-up care in the community for the individuals seen at outpatient facilities that provide CAMH services. All three outpatient facilities had access to non-medical treatments such as occupational therapy, speech and language therapy, and psychological therapies. There were no available data about the type of psychological intervention specific to children and adolescents with mental health problems. Furthermore, whenever specialized psychotherapies (i.e., psychotherapy for OCD, Tic disorder, behavioural interventions for autism...etc) were needed, patients and their families were referred to private clinics, which mostly provided CBT-informed therapies.

Regarding the availability of psychotropic medicines, the supply in the country was interrupted in 2019 and 2020 due to a combination of the COVID-19 pandemic, unstable economy, and the political situation in the country [33]. However, despite these challenges, facilities that provide mental health services for children and adolescents had at least one psychotropic medicine of each therapeutic class relevant to children and adolescents (antipsychotic, antidepressant, mood stabilizer, anxiolytic, and antiepileptic medicines). However, medications used for ADHD (i.e., methylphenidate) were classified in the Sudan Essential Medicines List in the category of drugs prescribed by specialists service. Hence it was available only in three pharmacies in Khartoum state [Personal communication, Dr Samah, Pharmacist at Taha Baashar Hospital, 13 December 2021]. Health insurance was available and provided by different insurance companies, however, the percentage of children and adolescents covered was not clear.

At the time of the situational analysis, there were three general adult psychiatric hospitals in Khartoum, with a total of 146 beds (Male = 94; Female = 52), representing 2.9 beds per 100,000 of the Khartoum population [17]. All of these facilities were organizationally integrated with mental health outpatient facilities. No beds in general psychiatry hospitals were dedicated only to children or adolescents during the study period from January 2019 to December 2020. Therefore, if admission was needed for a pre-adolescent (child), admission was to the female ward. Adolescents were admitted to a male ward. It is also important to mention that the admission of children and adolescents to these facilities was voluntary. Based on data from the registry of facilities that provided services for CAMH services, children and adolescents admitted to mental hospitals were primarily from four diagnostic groups: 1) unspecified psychological and behavioural disorders, 2) psychiatric disorders due to underlying medical conditions, 3) schizophrenia and related psychotic disorders, and 4) mood disorders. The average number of days spent in mental hospitals was not stated. However, informal data from practising clinicians working in CAMH facilities suggested that the admission period typically lasted between 7 to 14 days [Personal communication, Dr Emad Elsunni, Dr Mohja Ibrahim, and Dr Lubaba Abdalla, psychiatrists at Taha Baashar and Eltigani Elmahi Psychiatric Hospitals, 12 December 2021]. There were no CAMH day patient facilities, community residential facilities, forensic facilities, or CAMH hospitals in Khartoum state during the study period. The details of inpatients admitted to the facilities that provided CAMH services were available in Taha Baashar hospital, as presented in Table 2.3. Unfortunately, the number and percentages of inpatients below 18 years admitted with a mental health problem in the Military and Eltigani Elmahi hospitals could not be identified.

Table 2.3. The number of children and adolescents treated as inpatients at Taha Baashar Hospital in Khartoum in 2019 and 2020.

Age group	Number and gender	Jan-December 2019	Jan-December 2020
Age 0-4 years	Total number	10	9
	Gender	Females = 5 (50%)	Females = 4 (44.44%)
		Males = 5 (50%)	Males = 5 (55.56%)
Age 5-14 years	Total number	198	214
	Gender	Females = 75 (37.87%)	Females = 101 (47.19%)
		Males = 123 (62.13%)	Males = 113 (52.81%)
Age 15-24 years	Total number	2257	2379
	Gender	Females= 807 (35.75%)	Females= 877 (34.68%)
		Males= 1450 (64.25%)	Males= 1502 (65.32%)

According to the National Essential Medicines List (2014), three medications were listed in the child psychiatry category. These included atomoxetine (a non-stimulant medication for ADHD), methylphenidate (a stimulant medication for ADHD), and clonazepam (a benzodiazepine). There were no antidepressant, anti-anxiety, or antipsychotic medications for children included in the essential medicines list category during the study period. However, other medications used in CAMH were included under general psychotropic medicines (e.g., risperidone, clozapine, fluoxetine, sertraline, imipramine, valproic acid, lithium, carbamazepine and lorazepam). Methylphenidate was a controlled medication that was classified in the list of essential medicines as "medicines used by specialized centres and units in some designated hospitals" and was only available in

National Medical Supplies Fund pharmacies [34]. The Sudan Nation Supply Fund was established in 1935 as a central drug store affiliated with the Federal Ministry of Health. The main objectives were to increase coverage of essential and affordable medicines and prevention of the distribution of medicines from unreliable sources [34].

WHO-AIMS Domain 3: Child and adolescent mental health in primary healthcare

During the study period, the team could not identify information about CAMH at the primary care (PHC) level in Khartoum. However, in a WHO report on mental health in Sudan, clinics in primary care were described as both physician-based and non-physician-based [20]. The majority (>80%) had no assessment or treatment protocols for key mental health conditions available. They could diagnose and treat some psychiatric disorders in adults (e.g., depression, bipolar disorders, psychotic disorders). No data were available regarding mental health problems in children and adolescents [20]. The majority of the primary health care clinics (51-80%) made at least one monthly referral to a mental health professional. There was no mention of a referral process or whether it included a referral to specialized facilities that provide mental health services to children and adolescents. There was no clear communication process between primary care physicians and mental health professionals regarding individuals with mental disorders, including children and adolescents [20]. Interestingly, a School Mental Health Programme, a part of the school health programme, was represented in eight primary health care clinics geographically distributed in the Khartoum state localities (See figure 2.1). The programme was supervised by the Khartoum Ministry of Health (the School Health Directorate) in collaboration with the Khartoum Ministry of Education. The school mental health clinics, established in 1998, provided mental health services to school-aged

children. Unfortunately, we were not able to identify any specific numbers for children and adolescents seen during the study period. The programme included a package of early detection, intervention, management, and follow-up for school-age children with various psychiatric disorders. The process started with a mobile team (that included medical doctors, psychologists, dental care specialists, audiologists, and nutritionists), providing basic health education (including mental health) to teachers and students in all the government schools in Khartoum. Then a focal person (either a teacher or an educational psychologist) would then be allocated to report children at risk and children with symptoms of mental health problems. After that, the caregiver of a child with a mental health problem would be given a referral form to be seen in the nearest school mental health clinic. If further referral to a higher level of specialized services was needed, the process was unclear. In the SMH clinics, the staff included mainly psychologists. No psychiatric doctors were included since 2018 [Personal communication, Mrs Asma, coordinator of the SMH program, 12 January 2022]. Before 2019, psychiatry specialists used to see children with mental health problems twice weekly at SMH clinics. Most psychiatric doctors in the SMH programme were part-timers and resigned because of low payment [Personal communication, Dr Safa Elsarrg and Dr Bahja Hamed, psychiatrists who worked in SMH clinics, 10 December 2021].

The situational analysis also identified centres for traditional healing in the community, not regulated by the Ministry of Health [20]. They provided religious, spiritual, and cultural healing for their client, including children and adolescents, without basic mental health training. We were not able to find data about the number of clients, types of interventions, outcomes and feedback about these centres.

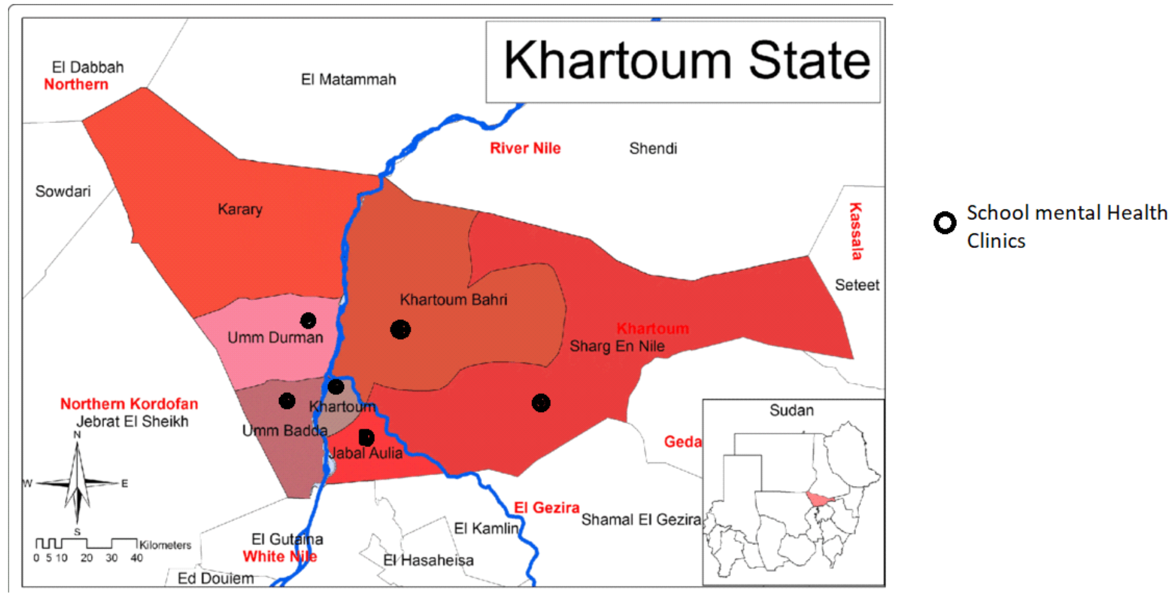

Figure 2.1. The figure shows the distribution of the school mental health clinics in Khartoum state.

We were not able to find data regarding refresher training on CAMH to doctors, nurses, or other staff provided at the primary healthcare level in Khartoum state during the study period. The last time practitioners at the primary care level received a comprehensive training course in mental health was in 2016 and organized by the Khartoum Ministry of Health and included primary care trainees. The training programme included topics on child and adolescent mental health [Personal communication, Dr Amal Eltigani, Psychiatrist, the Director of Eltigani Elmahi Hospital and mhGAP trainer, 10 February 2022].

In Sudan, medically-qualified and non-medically qualified primary health care workers (referred to as 'medical assistants') can prescribe basic psychotropic medications to

children and adolescents that are classified under categories AA, A, and B in the essential medicines list (i.e., medicines that used in health facilities run by community worker, medical assistants, and medical doctors) [35]. This included imipramine, amitriptyline, clomipramine, carbamazepine, and diazepam. The use of psychotropic medications for children with mental health problems by primary care providers was not clearly stated. Stimulants and non-stimulant medications for ADHD were only prescribed in a specialist services/ unit. In real-life practice, primary health care providers could prescribe a wide range of psychotropic medications to children and adolescents (e.g., fluoxetine, sertraline, risperidone, and olanzapine) without restrictions, except for stimulant medications, as outlined earlier. As for the availability of psychotropic medicines, most physician-based PHC centres had at least one psychotropic medicine of each therapeutic category (antipsychotic, antidepressant, mood stabilizer, anxiolytic, and antiepileptic) either in the facility or a nearby private pharmacy (which worked independently from the government sector). Medications were not provided free of charge except in the case of psychiatric emergencies, and the cost of the cheapest antipsychotic medication represented approximately 27% of the minimum daily wage, and the cost of the cheapest antidepressant medication ~18% of the minimum daily wage [20, 36]. There were no differences in the prices of psychotropic medication between the primary and specialist mental health services for children and adolescents.

WHO-AIMS Domain 4: Human resources

The WHO estimated the total number of human resources working in mental health facilities in Sudan to be 0.92 per 100,000 population [20]. The total number of workforces in the mental health facilities that provide care for children and adolescents in

Khartoum was estimated to be 0.1 per 100,000 population during the study period. No formal human resource data were available for CAMH during the situational analysis period. However, as shown in table 2.4, informal data suggested that 26 mental health professionals were working in facilities that provide services for children and adolescents [Personal communication from the three Psychiatric Hospital Directors and the coordinator of the SMH programme, 23 December 2021]. The two child psychiatrists worked both for government-administered CAMH facilities and in the private sector. The psychologists, social workers, and nurses worked for government-administered mental health facilities, either exclusively or also in other sectors.

Table 2.4: Informal estimate of the number and specialities of the mental health workforce who provided services for children and adolescents in Khartoum in 2019 and 2020.

Professionals	Number
Child and adolescent psychiatrists	2
Psychiatrists	3
Psychiatry trainees	3
Psychiatric nurses	1
Psychologists	13
Social workers	4
Occupational therapists	0
Speech and language therapist	0

WHO-AIMS Domain 5: Public education and links with other sectors

There were no coordinated bodies at the Federal and State Ministries of Health to oversee public education and awareness-raising campaigns specific to CAMH in Khartoum state during the study period. As a result, we were not able to identify any awareness-raising programmes specific to CAMH in Khartoum state during the study period. However, different NGOs, professional associations, private trusts/foundations, and international

agencies have promoted public education and awareness campaigns during the study period [20]. These campaigns targeted the general population, children, adolescents, women, and trauma survivors, e.g. gender-based violence.

Regarding the link and the collaboration between Health and other sectors in Khartoum, there were formal collaborations with the departments/agencies responsible for primary health care, child and family protection, education, and social affairs [35]. However, as stated earlier, the link was poorly defined.

WHO-AIMS Domain 6: Monitoring and research

The Sudanese Health Information System (HIS) was one of the first information systems in the region [15]. It involved data collection, processing, analysis, and dissemination. Data in the health sector in Sudan is collected by individual health facilities and communicated to the State and Federal Ministries of Health. The information obtained was used to produce periodic reports, make decisions, allocate resources, and monitor the plans and strategies [37]. Unfortunately, the HIS had various weaknesses in which information collected was not pooled into the HIS, and some facilities collected and used data for their activities and then stopped without disseminating their findings [38]. In addition, there was an overall limited capacity for analysis, utilization, and dissemination of data and findings [39]. There was no formally defined list of individual data items related to CAMH problems to be collected by all mental health facilities, as evident by the type of data from different facilities [Personal communication from the Head of HIS Department at the Khartoum Ministry of Health, 17 January 2022]. Instead, different mental health facilities registered different data related to CAMH (as shown earlier in

Tables 2.3 and 2.4). These included the number of outpatient clinics per week, number of patients seen in the facilities, diagnoses, and age ranges [Data department in Bashaar, Eltigani Elmahi, and the Military hospitals, 2021]. Furthermore, no formal reports were produced using the data transmitted to the Government Health Department [Personal communication from the Head of HIS Department at the Khartoum Ministry of Health, 17 January 2022].

In order to generate an overview of research relevant to child and adolescent mental health in Khartoum, we performed a data search for all relevant publications over ten years, including the two years of this situational analysis (2010-2020). Anticipating a low yield of peer-reviewed literature, we performed a broad online search on PubMed and Google scholar using "child and adolescent," "mental health," "Khartoum state," and "Sudan" as keywords. In addition, we asked local mental health experts (psychiatric doctors and psychologists) working in Khartoum hospitals to identify any potentially relevant publications in peer-reviewed and grey literature (including dissertations, reports, and non-peer-reviewed journals). As a result, a total of 11 articles were identified, as shown and described by study themes in table 2.5. Six of the identified articles were about trauma and stress-related disorders, two were about neurodevelopmental disorders and disruptive behaviours, and one about CAMH training in the middle-east region [20, 22, 39-47]. Furthermore, 90% (N= 10) of the identified research were conducted by Sudanese researchers.

Table 2.5: Research on CAMH in Khartoum state, Sudan, for the ten years from 2010 to 2020.

Research theme	Research Topic	Reference (First author, journal, year)
Neurodevelopmental disorder	The prevalence and factors affecting attention deficit hyperactivity disorder among school children in Khartoum State [40]	Osman, A. M., *Sudanese Journal of Paediatrics*, 2015
	Psychosocial Impacts of Mentally Retarded Children on Parents in Sudan [41]	Shabo, F. H., *Sudan Journal of Medical Sciences*, 2011
Training and CAMH systems	Child and adolescent psychiatry training and services in the Middle East region: a current status assessment [21]	Clausen, C. E., *European Child & Adolescent Psychiatry*, 2019
Trauma and stress-related conditions	Child sexual abuse presenting to police centres in Khartoum-Sudan; pattern and victim-associated factors [42]	Elhassan, N. M., *MOJ Clinical & Medical Case Reports,* 2016
	Child Sexual Abuse Khartoum, Sudan: Pattern and Offender Associative Factors [43]	Abunaib, S., *EC Clinical And Medical Case Reports*, 2018
	Cultural, psychological and social dimensions of children in a situation of trafficking [44]	Elhassan, N. M., *The Arab* Journal of the Social Sciences, 2015
	The school environment and their impact on the creation of attitudes and future trends of violence (in the Sudanese universities) [45]	Elhassan, N. M., *The Arab* Journal of the Social Sciences, 2015
	Effect of Corporal Punishment on Sudanese Pupils from Parent's Perspectives - Part 1 and Part 2 [46]	Elhassan, N. M., *MOJ Clinical & Medical Case Reports*, 2016
	Psychological impact on child soldiers in Sudan [47]	Elshiekh, A., *Sudanese Journal of Psychiatry,* 2011
Disruptive behaviours and related disorders	Research on the prevalence of conduct disorders among primary school pupils in Khartoum-Sudan [48]	Humaida, I. A. I., *Health,* 2012
	The nature and prevalence of psychiatric disorders in a Sudanese juvenile correctional facility [23]	Ali, A. S. *Sudanese Journal of Paediatrics*, 2016

Discussion

This study set out to perform a desktop situational analysis of CAMH services and systems in Khartoum state, Sudan for the years 2019 and 2020 by assessing the basic building blocks of mental health systems using a modified version of the WHO-AIMS [7]. It was, to our knowledge, the first-ever attempt to systematically describe CAMH services and systems in Sudan. Unfortunately, as anticipated, very limited data were available on CAMH in the public domain, and we had to depend on the personal communications of key stakeholders in the health and education system in the State. However, this finding is very much in keeping with the literature, which identifies CAMH as a largely neglected area within the mental health field [9, 30, 49]. Below we will summarise key findings from each of the WHO-AIMS building blocks and highlight gaps in knowledge about CAMH services and systems in the Khartoum State.

Domain 1: Policy and legislative framework

There was no CAMH policy in Sudan, and legislation related to children and adolescents with mental health problems was lacking and poorly represented in existing documents [35]. There is, therefore, an urgent need to develop effective and practical national CAMH policies to outline service and system needs, and legislations that would address the protection of the rights of children and adolescents with mental health problems. We were not able to find evidence of the involvement of children, adolescents and/or families in the development, monitoring or improvement of services. This would be a fundamentally important component to add in practice to ensure effective collaboration between policymakers and stakeholders (e.g., ministers of health, organizations, families,

and services users). There is also a need to disseminate legislation documents (i.e., Children's Act, 2010) to professionals working in CAMH and related sectors to be put into practice. It was also unclear how mental health, including CAMH, is financed and supported by the government, representing another clear knowledge gap in this WHO-AIMS domain.

Domain 2: Child and adolescent mental health services

The CAMH services in Khartoum state were not well-defined and were poorly developed. This has unfortunately been the case in low-income countries for more than 40 years [2]. Clausen and colleagues studied the CAMH services and training in the middle east region and highlighted the deficiency in mental health professionals to treat children with mental health problems, reflecting the reality of insufficient specialists in the LMICs [21]. The challenge of rebuilding and strengthening the existing CAMH systems and services can be reduced by improving access to services, reducing the stigma associated with mental disorders, and developing hospital-based specialist outpatient and inpatient CAMH services that are separate from adult health services [50, 51]. On the other hand, the shortage of qualified mental health professionals working in facilities that run services for children and adolescents represents another significant challenge (domain 4 of the WHO-AIMS). Lund and colleagues studied human resources and the cost required for improving the shortage of CAMH in South Africa by developing a model for that. They calculated that the minimum requirements per 100,000 population, the minimum coverage of full-time staff would need to be 5.8 in primary healthcare facilities, 0.6 in general hospital outpatient departments, 0.1 in general hospital inpatient facilities,

1.1 in specialist CAMHS outpatient departments, 0.6 in specialist CAMHS inpatient facilities, 0.5 in specialist CAMHS day services, and 0.8 in regional CAMHS teams [52]. However, it is clear that significant and sustained action over many decades will be required to create a CAMH specialist workforce to meet the needs of the population. Therefore, there is a clear need in Sudan also to consider how to use collaborative efforts to solve the problem of the shortage of health professionals and consider how to integrate CAMH services into paediatrics and general health programmes [53]. Such efforts would also need to establish clear referral pathways between different services and levels of care within the Khartoum health services. The study also found a reduction in the number of patients in 2020 in comparison to 2019. This was presumably attributable to the COVID-19 pandemic which brought lockdown across most parts of the world, thus impeding access to healthcare.

Domain 3: CAMH in primary health care

The link between different mental health care levels in Khartoum was not well established, and we found little evidence of regular CAMH training for primary care staff. Overloaded services, shortage of human and financial resources, and low recognition of the importance of CAMH could lead to low motivation for primary healthcare workers to provide CAMHS [49]. Therefore, there is a need to establish training programmes in the CAMH for professionals working at all levels of health care that provide services for children and adolescents with mental health problems. At the PHC level, the training may target prevention, early detection, reporting, and management of CAMH problems. A study by Akol and colleagues in Uganda evaluated the effect of PHC provider mhGAP training on the identification of CAMH disorders.

They concluded that mhGAP CAMH training of PHC providers increased the identification and reporting of children with mental health problems at the primary care level [54]. Given that a large portion of the population needs mental health services at community and primary care levels [10, 28], it is essential to find strategies to integrate CAMH at the PHC level and to reactivate the school mental health programme in Khartoum. The school mental health programme may represent a unique opportunity for detection, prevention, and treatment of different childhood mental health problems, given that it is based in the community, and could be integrated with primary health care levels to achieve accessibility and effective utilization of mental health services, while also increasing awareness of CAMH services [54]. The study could not identify other community platforms that might be used for mental health promotion/prevention.

The access to medications can be improved by providing the appropriate training to PHC providers in medication use and psychotherapy used for children and adolescents with mental health problems [55]. The current study revealed that psychostimulant medications were available only in the three National Medical Supply Fund pharmacies. Reviewing the list of essential medicine and improving the accessibility of PHC providers to medications used for children and adolescents with mental health problems and making them available would be an important next step.

Domain 4: Human resources

It is important to identify CAMH professionals (numbers, professions, geographical distribution, and their level of training) suitable to work in facilities that provide care for children and adolescents with mental health needs in Khartoum. Bearing in mind the limited number of trained professionals working in CAMH services in LMICs, as pointed out by Simelane and de Vries [8], task-sharing and finding innovative strategies to coordinate and use the available workforce may represent the most realistic and immediate opportunity to strengthen the CAMH workforce in Sudan. Task-sharing may involve a clear job description for the CAMH professionals with appropriate delegation depending on their level of training. Furthermore, it has been emphasized that improving the training on CAMH to primary healthcare providers is essential for delivering CAMH services in LMICs. Different studies recommended that training should include aspects of child development, interviewing techniques, understanding of risk factors, recognition of child psychiatric disorders, evidence-based interventions, and helping parents respond effectively to the child's emotional needs [55, 56]. This kind of training has shown good outcomes in CAMH [57]. It is also important to train all health workers who work with children and adolescents to be equipped to detect child abuse and to include mental health in the assessment of affected children. Another important goal in Sudan should be research capacity-building, as research training was indeed a major gap in Sudan, to ensure a new and well-trained generation of clinical CAMH researchers in Sudan and the Eastern Mediterranean Region.

Domain 5: Public education and link with other sectors

Information about public education about CAMH in Khartoum was limited, and no data could be found on public perceptions of CAMH. This is an important gap to address, perhaps by increasing awareness about CAMH problems. This may increase the likelihood of help-seeking behaviour from young people and their families to access CAMH services [7, 8, 18]. In addition, studies have reported a lack of coordination of CAMH services with other child-care sectors with most LMICs (63%) having only a few schools providing CAMH promotion and prevention activities. Only 1% of schools in these LMICs had one or more mental health professionals as part of their staff [55]. The school mental health system identified in this situational analysis presents a very powerful potential resource and system, and efforts to strengthen or re-establish links between health and education would be a crucial next step in Sudan.

Domain 6: Monitoring and research

It is essential to have an organized health information system that gathers and provides key information and data on CAMH to strengthen the systems and service and allow monitoring of progress among countries [30]. Despite the data reported by the facilities that provide services for children and adolescents with mental health problems being variable and inconsistent, our situational analysis identified a potential information system but it seemed that the system had not been used to its full potential and that no CAMH specific data variables had been included in it to date. CAMH-specific items may include the sociodemographic characteristics of children and adolescents with mental health problems, frequency of visits, together with either ICD or DSM diagnoses. This

will improve the quality of mental healthcare records and help periodic review of services and the needs before making appropriate modifications [2].

Our search for research output on CAMH in Sudan or from Sudan yielded 11 publications over 10 years, most of them in local journals. We have to conclude that CAMH research in Sudan is highly limited. National community-based epidemiological studies on the prevalence of different childhood mental health problems may be a very important contribution to understand the landscape of CAMH needs in the country. Another important goal in Sudan should be research capacity-building, to ensure a new and well-trained generation of clinical CAMH researchers in Sudan and the Eastern Mediterranean Region. Rahman and colleagues proposed three broad targets for research in CAMH: 1) epidemiology of mental health problems and their risk factors, 2) comparative need assessment, and 3) corporate need analysis [58]. We propose that an essential component of research-capacity building in Sudan should be efforts to build collaborative research in partnership with Government and across stakeholder groups (e.g. education, social care) to ensure that there is a joint agenda for research activities in the country [8]. It is also important to note that partnerships and collaboration between CAMH professionals from Sudan, other countries in the region (e.g., South Africa, Ethiopia, and Tunisia), and high-income countries could benefit CAMH services, research, and sharing of knowledge and experiences [58].

Strengths and limitations of the study

This study was, to our knowledge, the first-ever systematic investigation of CAMH services and systems in Sudan and therefore represents baseline data that can be used to develop a joined-up plan for CAMH service strengthening in the Khartoum State. We hope that the study will also provide a model for the examination of CAMH services and systems in other states of Sudan and other low-income countries. The most significant limitation of the study was the limited availability of data and documents that could be used in the situational analysis, hence the need for direct interaction with the Ministry of Health departments and relevant institutions to identify relevant documents. This was very much in keeping with our expectations but still presented a stark reminder of the challenges in many low/middle-income countries to find appropriate and relevant data to map CAMH. For example, the situational analysis performed by Mokitimi and colleagues [7] in the Western Cape Province of South Africa (typically thought of as a well-resourced country and province) showed the many knowledge and data gaps that their study encountered. We acknowledge that this desktop situational analysis was performed during the COVID-19 pandemic and that findings reported here a) did not focus on the impact of the pandemic or b) had access to any data that could have commented on the impact of the pandemic on CAMH system. However, as seen elsewhere around the globe we anticipate that the consequences of the COVID-19 pandemic were likely to have increased awareness of and need for access to mental health services and systems for young people, thus increasing the need for action in CAMH services and system. We also acknowledge that a 'desktop' situational analysis represented only one component of comprehensive and multi-level situational analysis [6]. It would, therefore, be important

to include the perspectives of senior stakeholders, service providers, and users as part of the next steps in research. Furthermore, Kruk and colleagues raised a question about the suitability and validity of global health assessment in the LMICs, but they did not specifically address mental health or the CAMH system [59]. However, as outlined in the thesis, the scope of the research project was very limited and has hopefully provided a helpful first step towards this broader goal.

Conclusions

This situational analysis represents an important milestone in CAMH services and system development in Sudan by describing strengths and gaps that need to be addressed. CAMH policy and legislation need to be prioritized as they lay the foundation for the CAMH system and services planning and development. The study also highlighted the importance of collaboration between health sectors at different healthcare levels. This can be achieved by providing appropriate professional training in CAMH to different mental health professionals who work in facilities that provide services for children and adolescents with mental health disorders. Moreover, supporting and strengthening CAMH at primary care and community levels (e.g., the School Mental Health Programme) can help identify and manage children at risk for mental health difficulties, increase community awareness, and reduce stigma. The COVID-19 pandemic is likely to have increased the need for CAMHSS and this would be an important area for future research. The main goal for CAMH in Khartoum is to upgrade the existing facilities and resources, train the workforce, emphasize research, and extend collaboration while reducing stigma and barriers to CAMH.

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List of Abbreviation

CAMH: Child and Adolescent Mental Health

EMR: East Mediterranean Region

FMOH: Federal Ministry of Health

LMICs: Low- and Middle-Income Countries

PHC: Primary Health Care

UNDESA: United Nations Department of Economic and Social Affairs

UNFPA: United Nations Population Fund

UNICEF: United Nations Children's Fund

WHO: World Health Organization

WHO-AIMS: World Health Organization Assessment Instrument for Mental Health Systems

Declarations

Ethics approval and consent to participate

The protocol was approved by the Human Research Ethics Committee, Faculty of Health Sciences, University of Cape Town, South Africa (HREC Reference: HREC026/2022).

Consent for publication

Not applicable.

Availability of data and material

The situational analysis was based on publicly-available data. Any data not in the public domain can be requested from the authors.

Competing interests

The authors declare that they have no competing interests.

Funding

The research did not receive funding from any institution, and all work was done independently by the research team.

Authors' contributions

KA – Conceptualised the idea, led protocol development, data analysis, and interpretation, and drafted and prepared the manuscript.

SM – Contributed to the conceptualization of the idea, led data collection, contributed to protocol development, data analysis and interpretation, and drafting of the manuscript.

PJdV – Contributed to the conceptualization of the idea, protocol development, data interpretation, and drafting and revision of the manuscript.

All authors read and approved the final manuscript.

Appendices

Appendix 1: Ethical approval letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45, E-52- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

17 January 2022

HREC REF: 026/2022

Prof P de Vries
Division of Child & Adolescent Psychiatry
DCAP 46 Sawkins Road, Rondebosch
Email: petrus.devries@uct.ac.za
Student: ABDKHA015@myuct.ac.za

Dear Prof de Vries

PROJECT TITLE: CHILD AND ADOLESCENT MENTAL HEALTH SERVICES IN KHARTOUM STATE, SUDAN: A DESKTOP SITUATIONAL ANALYSIS (MPHIL DEGREE - DR KHALID ABDALLAH ABDALHAI)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020: 06 July 2020 & 01 July 2021.

Approval is granted for one year until the 30 January 2023

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: -Dr Khalid Abdalhai will also be involved in this study.

Please quote the HREC REF 026/2022 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

HREC/REF 026/2022sa

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC/REF 026/2022sa

Appendix 2: Journal Publication Criteria

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Research articles should report on original primary research.

CAPMH strongly encourages that all datasets on which the conclusions of the paper rely should be available to readers. We encourage authors to ensure that their datasets are either deposited in publicly available repositories (where available and appropriate) or presented in the main manuscript or additional supporting files whenever possible. Please see Springer Nature's information on recommended repositories.

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Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should:

- Present a title that includes, if appropriate, the study design e.g.: o "A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"
- or for non-clinical or non-research studies a description of what the article reports
- list the full names and institutional addresses for all authors o if a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below
- indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the CONSORT extension for abstracts. The abstract must include the following separate sections:

Background: the context and purpose of the study

Methods: how the study was performed and statistical tests used

Results: the main findings

Conclusions: brief summary and potential implications

Trial registration: If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be in stated in this section. If it was not registered prospectively (before enrollment of the first participant), you should include the words 'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

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The Background section should explain the background to the study, its aims, a summary of the existing literature and why this study was necessary or its contribution to the field.

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The methods section should include:

- the aim, design and setting of the study
- the characteristics of participants or description of materials

- a clear description of all processes, interventions and comparisons. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses

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Discussion

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Conclusions

This should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

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If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations should be provided.

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- Ethics approval and consent to participate

- Consent for publication

- Availability of data and material
- Competing interests
- Funding
- Authors' contributions
- Acknowledgements
- Authors' information (optional)

Please see below for details on the information to be included in these sections.

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Manuscripts reporting studies involving human participants, human data or human tissue must:

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You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).

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All manuscripts must include an ‘Availability of data and materials’ statement. Data availability statements should include information on where data supporting the results reported in the article can be found including, where applicable, hyperlinks to publicly archived datasets analysed or generated during the study. By data we mean the minimal dataset that would be necessary to interpret, replicate and build upon the findings reported in the article. We recognise it is not always possible to share research data publicly, for instance when individual privacy could be compromised, and in such

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- The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.
- Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.
- The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name].
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Acknowledgements

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