A proposed digital platform for early school-based intervention of mental and developmental disorders in school-age children in KSA

1st N. I. Alnaghaimshi
Department of Computer Science and Information
Majmaah University
Al-Majmaah, 11952, Saudi Arabia
n.alnaghaimshi@mu.edu.sa

2nd A. Alhazmi
Department of Developmental and Behavioral pediatrics
Children Hospital, King Saud Medical City.
Riyadh, Saudi Arabia
a.alhazmi@ksmc.med.sa

3rd S. A. Alneghaimshi
General Directorate of Education in Al-Qassim
Ministry of education
Al-Qassim, Saudi Arabia
s.alneghaimshi@gmail.com

4th H. J. Alshalani
Department of Computer Science and Information
College of Science, Majmaah University
Al-Majmaah, Saudi Arabia.
Hessaj134@gmail.com

5th S. A. Alqanwah
Department of Computer Science and Information
College of Science, Majmaah University
Al-Majmaah, Saudi Arabia.
shadenabdullh@gmail.com

6th S. S. Almutairi
Department of Computer Science and Information
College of Science, Majmaah University
Al-Majmaah, Saudi Arabia.
sara97.cs@gmail.com

Abstract— **In light of the deleterious consequences of childhood mental and developmental disorders, early and effective interventions and support are critical for children's growth and development. In Saudi Arabia, the focus of this study, despite the growing interest in providing health care and support services for children and adolescents with mental and developmental disorders, there is no system designed to allow coordination and organization of efforts between the school environment in cooperation with the family and the health system in the Kingdom to facilitate the process of early and effective interventions of these disorders. This paper proposes a system to link the school system and health-care system to work together more closely to provide early intervention for school-age children and adolescents with the goal of reducing the prevalence of childhood mental and developmental disorders.**

Keywords: Childhood, Mental disorders, Developmental disorders, Intervention.

I. INTRODUCTION

Childhood mental and developmental disorders represent an emerging challenge to health-care systems worldwide [1]. In Saudi Arabia, the focus of this study, to the best of our knowledge there are no recent estimated rates of childhood mental and developmental disorders.

Childhood mental and developmental disorders require a significant support from families, educational systems, and community. Children with these disorders are more likely to experience a compromised developmental trajectory, with increased need for medical and disability services; such disorders frequently persist into adulthood [2][3][4].

Early intervention is critical to reducing the prevalence of childhood mental and developmental disorders and their symptoms, thus optimising children's developmental outcomes [5].

II. BACKGROUND

A. Childhood Mental and Developmental Disorders – Risks and Impacts

Mental and developmental disorders identified in childhood are likely to persist into adulthood. Such disorders have been shown to increase the risk of poorer school outcomes, reduce employment opportunities, lead to other adverse health effects, and result in earlier mortality [6].

Childhood developmental disorders can be several: (1) emotional or behavioural disorders; (2) cognitive disorders (e.g., intellectual capacity); (3) language and social disorders (e.g., autism spectrum disorder); and (4) physical disabilities (e.g., cerebral palsy) [7].

In the Arabic countries in general, there is a critical need for efficient screening procedures and effective intervention strategies for childhood mental and developmental disorders. This is especially the case

given the lack of data on the risk and prevalence for childhood disorders for many of these countries including Saudi Arabia, the focus of this study. UAE study [8] showed that many childhood developmental disorders in the state are not detected because parents failed to identify the delays as result of lack of awareness of these disorders and because of the nature of developmental screening programs available in the state.

Mental disorders among children refer to serious changes in a child's behaviour or emotions which affect quality of life. Children with mental disorders may engage in unsafe behaviour, self-harm behaviours, or may lose interest in things that they used to enjoy. Indeed, it has been reported that most mental health disorders among adults have their roots in childhood [9].

It has been estimated that 10–20% of children and adolescents worldwide are affected by mental health disorders [10]. In Canada alone, it has been reported that over 800,000 children experienced mental disorders, suggesting that "mental disorders are arguably the leading health problems that Canadian children face after infancy" [11]. Among Canadian children with mental health disorders, only 25% of them had access to mental health-care services [12].

According to [13], lack of access to specialist health-care services, little or no awareness of available health-care services, and uncertainty about whether the behavioural or mood changes in children require treatment are among the main reasons that prevent children from receiving psychological health care.

Mental health disorders not only greatly affect the individual's ability to accomplish normal developmental tasks and the lives of their family members, but also there are high economic costs [9]. Economic costs attributable to mental disorders for young people are estimated to exceed $14 billion annually in Canada [14], and $247 billion annually in United States [9]. However, early interventions are shown to have potential lifetime benefits, and such interventions can be effective in delaying or preventing mental health disorders among children and youth [9].

B. Intervention for Childhood Mental and Developmental Disorders

Intervention for childhood mental and behavioural disorders refers to identifying and providing specialised support to children who are at risk of emotional, cognitive, behavioural, and neurodevelopmental disorders. Increasing evidence shows that interventions at early stages can benefit the children's development. In fact, early intervention, access and receipt of needed health-care services and support have been shown to have the potential to improve health and well-being for children with mental and developmental disorders throughout their lifespan [6]. A study conducted in 2013 demonstrated that children with autism spectrum disorder (ASD) receiving early intervention, showed an increase in their mean IQ scores after treatment [15].

In contrast, robust evidence indicates that a lack of early intervention and detection can have strongly negative implications for the children's future. For example, growing evidence shows that a significant proportion of adults' mental health issues originate in early childhood [16][17].

[18] show that school engagement in early identification of mental and behaviour disorders is meaningfully associated with service use for children and adolescents. Mental health service contact could be initiated, argue Green et al., if schools were helped by special programmes to identify and refer children and adolescents.

III.   WHAT IS AIHTIWA?

To optimise child development, what is needed is an active collaboration between health-care system and school system in the state to aid intervention for childhood mental and behavioural disorders. School systems can play a critical role in providing integrative care for children with mental and developmental disorders by helping to improve access to high-quality health-care programs and services that meet children's unique needs and help them achieve optimal outcomes. This paper proposes AIHTIWA as a platform that facilitates health-care interventions for childhood mental and developmental disorders by linking the educational system with the national paediatric developmental disorder program (NMO) which is affiliated to the Saudi Ministry of Health. AIHTIWA is using a

variety of common screening tools for early detection.

The proposed system is limited to the following childhood mental and behavioural disorders conditions:

- *Anxiety Disorders:* Anxiety disorders are also known as "emotional disorders". It has been reported that anxiety disorders are among the most prevalent psychiatric disorders diagnosed in childhood that are associated with functional difficulties and that tend to persist into adulthood [19]. Anxiety has been defined as tension, uneasiness, or apprehension that stems from the anticipation of danger, which can be either external or internal [20]. Even though anxiety disorders are associated with a high burden of illness, they are usually under recognized and undertreated in primary care [21].

- *Depression Disorders* (DD)*:* Biologic, psychological, or environmental have been reported as the main factors that affect the risk of depression in children and adolescents [22] [23]. DD is a mood disorder that causes a persistent feeling of loss of interest and sadness. It has been reported that DD can affect future development; children who have early episodes of DD are at increased risk into adulthood. According to [24], childhood depression can double the risk of depression in early adulthood.

- *Stress:* Stress is a biological response to stressful environments, events, and situations that can lead to various pathophysiological complications ranging from alterations in homeostasis to life-threatening effects and death [25]. Stress can cause changes in different structural areas of the brain and lead to long-term effects on the nervous system [26][27].

- *Autism Spectrum Disorders (ASD)*: One the most common behaviourally defined neurodevelopmental disorders among children is ASD [28][29]. Children with ASD are characterized by persistent impairment in reciprocal communication, restricted repetitive pattern of behaviours, interests or activities, and social withdrawal [28].

- *Attention Deficit Hyperactivity Disorders (ADHD):* It is one of most common behavioural disorders of childhood [30]. Children with ADHD experience negative effects on their social, family and school adaptation [31][32][33][34].

- *Oppositional Defiant Disorders (ODD):* According to the American Psychiatric Association, the essential features of ODD are behaviours directed towards figures of authority, and these behaviours display as recurring patterns of hostility, disobedience, defiance, and negativity [38]. The National Comorbidity Survey Replication (NCSR), assessing childhood disorders from retrospective adult reports, reported that ODD that occurs in childhood pre-dates the onset of a range of emotional as well as behavioural disorders in early adult life [35].

- *Conduct Disorders (CD):* CD are the most common psychiatric diagnoses among children and adolescents, and one of the most common reasons for clinical referral [36][37]. Essentially, CD is behaviour of a persistent and repetitive nature. Such behaviour is characterised by violation of the rights of others or rules or norms of society considered dominant and appropriate to an age [38].

IV. DESIGNING AIHTIWA

In this project, we followed a user-centred design philosophy in the design of AIHTIWA. An iterative, user-centred approach employed in this project helps to develop an understanding of school counsellors' experiences of early detection and intervention of childhood disorders locally; additionally, it helps to gather the system's requirements.

A. *Conducting interviews with school counsellors*

In this project, a convenience sample of 6 school counsellors was used to conduct one-to-one 45-minute interviews. Participants' work experience ranged between 4 and 23 years. Each interview was audio recorded, and once a sufficient level of saturation was achieved during interviews, the audio recordings were transcribed and analysed using an

inductive thematic analysis. During the analysis stage, transcripts were read repeatedly and a coding framework developed. Interviews' transcripts were re-analyzed in light of themes that had emerged during coding.

Based on interview results, an initial visualization of the tools and features that will be provided by the platform was identified. A medium-fidelity prototype was then developed.

B. Co-designing with school counsellors

Following interviews, a workshop was conducted with study participants to review and evaluate the developed prototype. Participant feedback on prototypes helped to refine content, functionality, and design of system. All the suggestions and identified issues during workshop were considered and addressed before development stage.

V. RESULT

A. Need for screening tools and extensive follow-up

It was clear from the responses of the participants that psychological and developmental problems and disorders are widespread among students, especially in recent times. As one participant said, "It is a big and noticeable problem and its causes are cumulative, but disclosure is not the prerogative of the student counsellors. Our role is to study the case after discovering it and focus on delays. Study or symptoms shown on students such as anxiety, especially after parents' divorce, and speech disorders, which are the most cases we deal with" (P2).

Another participant mentioned that "We, as student counsellors, are not trained to detect mental and behaviour disorders, as we are basically teachers. We took a general course in student counselling for a year only. We only study the case after discovering it with the student's guardian and then if an intervention is needed, it is transferred to the Student Counselling Unit in the Education Department to follow up" (P4). And one of the participants added, "and even the Student Counselling Unit in the Education Department, its members are non-specialized on mental and behaviour disorders. They receive the case study from the school's student advisor and they

are in charge of asking the guardian to transfer child to a specialist in psychiatric or developmental diseases, but they also lack a follow-up on the student's condition and make sure that the student got treatment" (P2).

Moreover, it was noted from the student counsellors' responses that the counsellors struggle because the guardian is reluctant to get help for a child. A participant stated that "In mental disorders, many parents do not believe in psychological treatment or are afraid of stigma, so the ministry must oblige parents to treat child or refer to the region's emirate to take action" (P1).

When the student counsellors were asked to suggest solutions that might help in early detection and dealing with developmental and psychological disorders among students, they agreed on several things, including the importance of early detection of student cases of psychological and developmental disorders, which is important. As one participant mentioned, "Detecting cases early will become a proactive process. For treatment and avoiding future problems for each case" (P3). Therefore, it is important to train student counsellors to detect cases of mental and developmental disorders in the early stages in cooperation with teachers, and the Ministry of Education should not burden the counsellor with excessive paperwork, instead give the counsellor more time to detect and follow up students' disorders. As one participant asserted, "We are usually overwhelmed with paperwork. If we had been trained in early detection of mental and developmental disorders, the success would be better in providing care to students" (P1).

B. Proposed App Requirements and Properties

Detection of child and adolescent psychological and behavioural disorders is a crucial factor which would determine to some extent the prognosis for those cases. For instance, if the cases with a disorder were detected early, the intervention can be started early too which raises the chances for these cases to reach their potential later in life. Thus, the chance of improvement will be much higher for those with disorders detected early than those who suffer from disorders and receive delayed intervention and treatment owing to late detection.

The proposed system will make screening instruments available to school counsellors as the first step for early intervention and detection of childhood mental and behaviour problems. As one of main tasks of schools is to support children's and adolescents' development while growing up [18], we believe that school counsellors are uniquely positioned to help collaboratively in screening children with the tools provided by our proposed system. These tools would identify any areas of concern that may require a further examination or evaluation by health-care providers to receive needed intervention services and support. Through the proposed system (as shown in Figure 1 below), a school counsellor can choose and use from a variety of screening tools, according to the symptoms that have been detected by the school counsellor and teachers, to identify children in need of health-care interventions for mental and behavioural disorders.
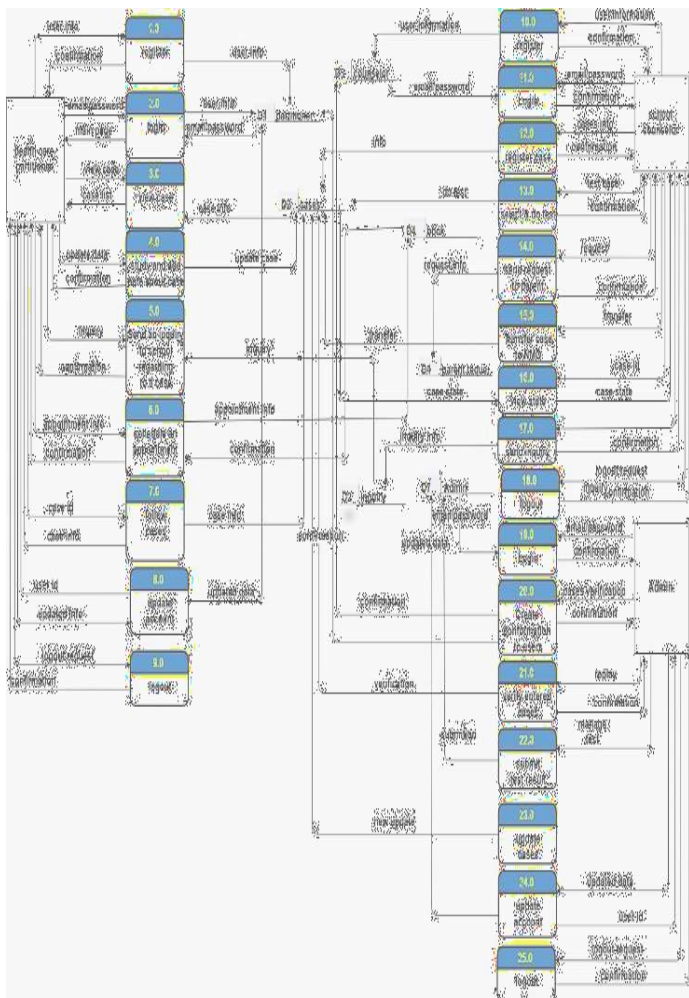

Figure 1: system flow diagram.

Based on screening-tool result, the referral is made from school to NMO which, in turn, refers the case to the competent clinics of the Ministry of Health according to the region allocated to receive the case and conduct the necessary tests.

In our project, we have chosen common screening tools used in many cultures, environments and health-care systems worldwide. These tools would cover the most common psychological, neurodevelopmental and behavioural disorders in our settings. The following screening tools will be used in the project: Modified Checklist for Autism (MCHAT) and Social Communication Questionnaire (SCQ) to detect those cases at risk of ASD in different ages; Vanderbilt parents and teacher questionnaire to detect the cases at risk of ADHD, ODD, CD and anxiety from school age and so on; and DASS to detect the cases at risk of depression, anxiety and stress disorders at different ages. The aforementioned screening tools were validated and translated to Arabic language by other studies [39][40][41][42].

We believe, however, that this proposed system will be a handy tool to help to detect signs of childhood mental and developmental disorders, and it will improve access to high-quality health-care programs and services that meet their unique needs of those children. Furthermore, it will help to collect rich data on prevalence of childhood mental and developmental conditions among the total population. Data that can be collected through the system will help in understanding the nature of childhood mental and developmental disorders in the state. Understanding the prevalence of these childhood disorders can help direct future research. Further, it will aid planning the necessary early intervention and health services for these conditions.

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