Framework for designing a national model of depression information system in Iran

Abstract

Background: Depression is the most common mental disorder worldwide, affecting a range of different age groups, including adolescents and youth. This study aimed to provide a national model for a depression information system in Iranian adolescents and youth.

Methods: This applied study was conducted in three stages. In the first stage, depression information systems in different countries were examined by conducting a literature review, and Denmark, the United States of America, China, Indonesia, and India were selected as the countries for conducting a comparative study. In the second stage, after reviewing information sources, conducting a comparative study in the selected countries, and also considering the geographical and social conditions of Iran, a proposed model for the national depression information system in Iran was presented. In the third stage, the proposed model was validated using expert opinion obtained from specialists in psychiatry, psychology, and health information management, and finally approved after incorporating their feedback.

Findings: Two parts, structural components and key processes of the information system, were identified as the main components of the proposed model of the information system for depression in adolescents and youth in Iran.

Conclusion: By implementing a national information system on depression in adolescents and youth, systematic access to accurate data and statistics related to depression in this population group will be provided. The model in the present study can provide an appropriate information infrastructure for the implementation of a national information system on depression in adolescents and youth in Iran.

Keywords: Adolescent, Youths, Information system, Depression, Registry

Introduction

More than one billion people worldwide suffer from various types of mental disorders. There is a wide range of mental disorders that affect people's thoughts, relationships, interests, and emotions. One of the most common mental disorders worldwide is depression. Depression is recognized as a major global health issue because it affects a wide range of age groups [1-4]. Depression is often referred to as the "common cold" of mental health due to its prevalence and widespread impact on people's lives. Depression affects more than 300 million people worldwide[5, 6].

This mental disorder is characterized by persistent sadness, loss of interest and pleasure, and a spectrum of emotional, cognitive, physical, and behavioral symptoms. Various factors contribute to the occurrence of depression, including demographic characteristics, socio-economic status, exposure to stressful events, personal and family history of mental disorders and drug use, and cultural and social contexts [7, 8].

Today, one of the significant concerns in global health is the growing prevalence of depression in adolescents and youth. This issue can be associated with serious health consequences and lead to decreased academic performance, increased drug use and abuse, decreased well-being, and increased social problems [9]. Apart from these consequences, in severe cases, depression can lead to suicide, which is currently the second leading cause of death among people aged 15 to 29. Although depression is treatable and preventable, it is still not properly managed and treated in many countries [3, 10, 11].

Despite the increase in awareness of depression in the last two decades, challenges related to its early recognition and effective management remain. Screening and timely diagnosis play an important role in improving treatment outcomes, reducing relapse and improving the quality of life of patients. Collecting accurate data on the prevalence, risk factors and treatment patterns of depression is essential for policy-making, planning and designing effective mental health interventions [12, 13].

Despite increasing attention and public health efforts, depression is often not diagnosed until it is severe. The complexity of the causes that contribute to depression poses a major challenge in addressing its various stages. The disease has multiple and diverse factors resulting from genetic, environmental, psychological, and social factors. Therefore, adopting an interdisciplinary approach that can collect and manage large volumes of data is of great importance[14].

Cultural differences, values, family structures and different social contexts play an important role in the occurrence and treatment of depression. Therefore, designing interventions that are adapted to the cultural context of each country is a key step in improving the effectiveness of depression interventions [15, 16].

The increasing growth of health data makes the use of information systems in healthcare essential to provide up-to-date and relevant information about the health needs of the covered population[17].

Since mental health is directly related to individual and social functioning and psychosocial impairments, the importance of designing and developing efficient and integrated information systems is a high priority for the health and medical care system of any country [18, 19]. Information systems facilitate access to data by collecting, recording, retrieving, and processing data, and improve decision-making [20].
Depression information systems can help policymakers, managers, and clinicians by collecting and managing information optimally to improve the quality of life of adolescents and youth, identify problems, make evidence-based decisions, and adopt coherent and correct policies in the treatment and management of depression [16, 21, 22].
Implementing an information management system will reduce time spent on manual tasks, increase accuracy, facilitate access to health data, and improve service effectiveness [23]. Overall, information systems have revolutionized healthcare, enabling better diagnosis, treatment decisions, care coordination, and quality improvement. By using an information system, healthcare providers can streamline workflows and ultimately improve the quality of patient care [24].
Registries are supportive information systems that are critical for organizing patient data, systematizing care delivery, and tracking patient health outcomes. To this end, Yang et al. [25] designed and clinically implemented a depression registry as part of a collaborative care intervention for depression. The primary goal of designing this registry was to identify and track patients with depression and monitor antidepressant treatment.
In an applied descriptive study, Asadi et al. [29] designed a national information management system for COVID-19 vaccination in 2023 to manage information related to vaccine receipt and its possible side effects. The validation of the national information system model for COVID-19 vaccination of pregnant women was examined in two stages using the Delphi technique. Finally, the final model was presented in two main groups, including structural components (responsible organization and databases, monitoring center, participating organizations and data sources) and information process (data set, data collection, quality control, data exchange, data processing, reporting).
Today, while developed countries are increasingly using information systems for disease management, using their experiences can help improve such systems in low-income countries [26]. To this end, in the present study, the research team, inspired by studies conducted in Denmark, the United States, China, India, and Indonesia, conducted a comparative study and thoroughly reviewed and analyzed the information systems of these countries.
Given the importance of information systems in the management and control of depression, improving planning and advancing related goals, designing and developing a depression information system to manage and organize data is an essential need. Therefore, this study aimed to provide a national model for a depression information system in Iranian adolescents and youth.

Materials and Methods:

Study Design

This is an applied study that used a mixed design by combining qualitative content analysis and and expert validation. The study was conducted in three separate stages, including a literature review and a comparative study, presenting the model, and validating the national model of the Depression Information System in adolescents and youth.

Phase A: Literature review and comparative study

In the first stage, a comprehensive literature review was carried out in the PubMed, Scopus, and Web of Science databases to identify national or large-scale depression and mental health information systems. A comprehensive search strategy was developed using a combination of Medical Subject Headings (MeSH) and free-text terms related to depression and information systems. The main keywords included terms such as “depression”, “adolescent”, “youth”, “information system”, “health information system”, and “registry”. Relevant articles were retrieved using predefined keywords and inclusion/exclusion criteria. After screening titles, abstracts, and full texts, information systems that provided sufficiently detailed and transparent descriptions of their structure and processes were shortlisted. After reviewing and screening the literature, five countries—Denmark, the United States, China, India, and Indonesia—were selected for comparative analysis. The aforementioned five countries were selected for the comparative study based on several criteria, including the availability of comprehensive and transparent information regarding their information systems and their geographical representation across Asia, America, and Europe. They also represent a range of economic and health care system contexts, allowing for the extraction of adaptable components and best practices to develop a national their information systems, model for Iran. Then, the structural components and key processes of these information systems were extracted.

Phase B: Presentation of the proposed model of the national depression Information System

In the second stage, after reviewing information sources, conducting a comparative study in the selected countries, and also considering the unique climatic, geographical, cultural, and social conditions of Iran, a proposed model was presented. This model was designed in two main parts, including the structural components and key processes of the depression information system in adolescents and youth. At this stage, no external participants were involved; the research team constructed the preliminary model based on the synthesized evidence.

Phase C: Validation of the model and presentation of the final model of the national depression Information System

In the third stage, the proposed model was validated through a survey of a panel of experts. A structured and closed questionnaire was developed based on the dimensions of the model identified in stage 2. The questionnaire included items related to each key structural and process component, with binary response options ("yes" or "no") indicating agreement with the inclusion of each item in the model. An open-ended section at the end allowed participants to provide qualitative comments, corrections, or new suggestions.

The designed questionnaire was administered to 60 experts, including 50 psychiatrists and psychologists, and 10 health information management experts. Experts were selected through purposive sampling based on their academic qualifications, at least 5 years of relevant professional experience, and previous work experience in clinical, research, or management areas related to mental health or health information systems. Experts assessed the relevance and practicality of each component of the model. Items that achieved broad agreement among experts were retained, while items that had conflicting feedback were modified based on their qualitative comments. After reviewing all feedback, an expert panel consisting of three psychiatrists/psychologists and three health information management specialists reviewed the revised model and ensured its conceptual integrity and practical applicability. Finally, the experts validated the model, which was presented as a final schematic diagram.

Ethical considerations:

In order to comply with ethical standards, the identities and responses of the experts were kept confidential during the validation of the proposed model. In addition, they were assured that their participation in the validation stages was voluntary and they could consciously withdraw from the study at any stage. This study was approved by Shahid Beheshti University of Medical Sciences under the ethical code number IR.SBMU.RETECH.REC.1404.019 from the National Committee for Ethics in Biomedical Research in 2025.

Findings:

The findings of this study are presented in three sections as follows:

Findings from a comparative study in selected countries:

In this section of the study, the depression information system in selected countries was examined from two dimensions: structural components and key processes. The results of the comparative study in selected countries (Denmark, United States of America, China, India and Indonesia) are presented in Tables 1 and 2.

Table 1. Structural components of the depression information system in selected countries

Components / Countries	Denmark	India	USA	China	Indonesia
System objectives	To assess and improve the quality of treatment and care for patients with depression in Denmark, with a focus on	Development of a smartphone-based home care system to monitor and identify symptoms of depression	Improving the quality of care and treatment outcomes for patients with depression by identifying and following up on	Screening and early warning for people at high risk of depression to prevent the onset and severity of this disease through early identification	Developing a prenatal depression diagnosis system model to detect symptoms of depression in

	treatment effects, suicide risk assessment, transition from inpatient to outpatient status, and making epidemiological research available.		patients with depression, providing access to specialized care, assessing the effectiveness of antidepressant medications, and monitoring the treatment process.	of depression, providing preventive warnings, mental health support, reducing treatment costs and serious consequences of depression	pregnant women as soon as possible and reduce complications, including reducing mortality rates in mothers and infants.
Responsible organization and monitoring centers	Danish Ministry of Health	Ministry of Health and Family Welfare	CDC	National Health Commission (NHC)	Indonesian Ministry of Health
Monitoring method	Active & inactive	Active & inactive	Active & inactive	Active & inactive	Active & inactive
Monitoring levels	National, regional	National, regional	National, state	National, regional	National, regional
Information sources	Danish National Patient Register, psychiatric departments of hospitals and outpatient clinics, clinical questionnaires and assessment interviews of psychiatrists, psychologists, nurses, occupational therapists and social workers	Android app "Mind at Ease" / Psychiatrists	Physicians, medical team members, electronic health record (EHR), patient health questionnaires PHQ-9 and PHQ-2	Mobile apps, cloud forms, smartwatches and wearables	Healthcare professionals, mental health professionals, midwives, Edinburgh Postnatal Depression Scale (EPDS)
Participating centers	- Ministry of Health - National Agency for Health and Medicines, Regions of Denmark, - Professional healthcare organizations - Scientific associations	SRM Institute of Science and Technology	University of Colorado School of Medicine/FDA	(Hangzhou Normal University) / (Nanjing University of Information Science and Technology) / Zhejiang Traditional Chinese Medicine Science and Technology Plan Project Zhejiang Health Science and Technology Plan Project	University of Indonesia , National Institute for Health and Care Excellence (NICE) Guide, Organizations involved in improving maternal and child health

Table 2. Key processes of the depression information system in selected countries

Components / Countries	**Denmark**	**India**	**USA**	**China**	**Indonesia**
Data set	Demographic data, hospitalization and treatment	Patient demographic data / PHQ-9 questionnaire	Demographic data, clinical data, medication	Demographic data, lifestyle and risk factor data, mental	Demographic data of pregnant mothers,

	data, clinical assessment and suicide risk data, post-discharge care planning and prediction data	scores: / Educational and work status / GPS data / Phone usage pattern / Sleep pattern / Type of apps used on the phone / Lifestyle data / Alcohol consumption, etc. / Data from surveys by psychiatrists for initial diagnosis of depression	data, data related to medical history and other relevant diagnoses	and emotional health data, data collected through wearable devices, combined data (audio and video)	pregnancy history and mental health, family and social support, environmental conditions and risk factors, history and results of previous assessments, Edinburgh Depression Scale (EPDS) scores
Data collection	Extracting data from the national patient registry, recording and collecting data by the treatment team including psychiatrists, psychologists, and nurses in psychiatric hospitals and clinics, and completing key treatment indicators by the clinics for each patient.	Manual data collection in the form of a self-reported survey that combines the PHQ-9 survey and a set of questions recommended by psychiatrists. Electronic data collection via the user's smartphone, GPS data, and applications	Data collection was done by completing a patient health questionnaire by patients whose list was extracted from the EHR by clinic staff according to pre-determined criteria and variables for identification, tracking, and prioritization.	Collect data electronically via cloud forms on social platforms, mobile apps, smartwatches	Collect data electronically through registration forms and questionnaire completion
Data quality control	Matching information with the Danish National Patient Registry to ensure accuracy and completeness of data, data review by the treatment team	Automated data accuracy and completeness checking, review and monitoring by psychiatrists	Ensuring data accuracy and completeness with Plan-Do-Study-Act (PDSA) validation cycles, ensuring the accuracy of data used through the Data Dictionary, and assessing the completeness of recorded information by	Ensuring the proper functioning of all modules, including data recording, processing, and sending alerts, using black box testing (to check overall system performance) and white box testing (to evaluate program	Checking the logicality and completeness of data electronically during the completion of the questionnaire Regular review and monitoring of data accuracy by midwives (monitoring by health professionals and midwives / automatic

			responsible physicians	structure and code).	monitoring by the application)
Information exchange	Connecting databases to each other and providing the necessary information, sharing data between doctors and exchanging it for the purpose of conducting epidemiological research.	Linking databases to each other and sending the required information	Linking databases to each other, sending required information, and sharing data between members of the treatment team, managers, and other related institutions.	Linking to the database to access the required information	Connecting people and connecting databases to each other and providing the required information
Data processing	Processing and analyzing data using descriptive statistics	Data processing and analysis using descriptive statistics and machine learning algorithms	Data processing calculation using descriptive statistics	Data calculation and processing using descriptive statistics, data analysis with SPSS, complex data processing using machine learning algorithms	Calculating and processing data using descriptive statistics
Reporting	Submit an annual report published on the Internet	Weekly reports via web application available to doctors (Doctor Portal web application)	Weekly reports to CCD intervention team members, physicians, primary care manager, and designated staff	People who are at high risk of depression after screening are identified and then reminded via SMS, and then various interventions are provided for them.	Publishing periodic, regular and accessible reports for healthcare professionals and midwives

Findings from the proposed model of the information system for depression in adolescents and youth in Iran

The proposed model of the information system for depression in adolescents and youth in Iran is divided into two main parts, including the structural components and key processes of the depression information system. The structural components section includes the objectives, responsible organization, participating organizations and centers, data sources, databases, monitoring centers, and key processes, including data sets, data collection, quality control indicators, quality control methods, data exchange, types of data processing, reporting and information methods, and report users. Table 3 shows the proposed model of the information system for depression in adolescents and youth in Iran.

Table 3. Components of the proposed model for the national information system on depression in adolescents and youth for Iran

Components	
Structural components	
Objectives	Collect, record, monitor and manage information related to depression in the youth and adolescent population to provide appropriate programs and strategies for prevention and treatment in this group of the population
Responsible Organization	Ministry of Health, and Medical Education
Participating Organizations and Centers	Minor Health Office of the Ministry of Health, National Welfare Organization, Statistical Center of Iran, Mental Health Department of Medical Sciences Universities, Forensic Medicine Organization, Anti-Drug Headquarters and Addiction Treatment Centers, Law Enforcement and Judicial System, Universities and Research Centers, National Center for Addiction Studies, Insurance Organizations, Ministry of Science, Research and Technology, Ministry of Education, Social Work, Relief Committee, Shelters, Media and Awareness Institutions, Psychology and Counseling System Organization, Iranian Psychological Association, Active Non-Governmental Organizations and Support Institutions in the Field of Mental Health
Data Sources	Mental Health Service Providers / Health Information Systems in Medical Centers / Mental Health Research Centers / Statistical and Research Databases / Specialized Psychiatric and Psychology Clinics / Mental Health Applications / Mental Disease Registration and Reporting Systems / School Mental Health Screenings / Medical Records / Integrated Health System (SIB)
Database	Creating a Database National database of information on depression in adolescents and youth in the Department of Mental Health of the Ministry of Health, and Medical Education, creating a relevant database in each of the relevant centers
Monitoring Centers	Monitoring Center for the National Information System on Depression in Adolescents and youth in the Department of Mental Health of the Ministry of Health, and Medical Education Infrastructure Management Center for the National Information System on Depression in Adolescents and youth in the Deputy for Technology of the ministry of health and medical education
Key processes	
Data sets	Identification and demographic data / Clinical data / Assessment and diagnosis data / Treatment data / Social and support data / Lifestyle and risk factor data / Educational and occupational data / Economic status data / Quality of life data / Emergency contact data / Consent and privacy data
Data collection	Manual and electronic questionnaire form
Quality control indicators	Completeness, timeliness, accuracy and precision of data, data up-to-dateness, data integrity, security and confidentiality, definition, validity, non-duplication of data
Quality control methods	Review of duplicate cases, review of incorrect and missing, irrelevant and inappropriate information, review of medical records, final review before analysis
Data exchange	Sending information offline and online from information systems in urban centers to information systems in provincial and national centers
Types of data processing	Calculation of descriptive statistical indicators based on variables (age, gender, severity of depression, etc.) Statistical analyses of the state of depression Calculation of the spatial distribution of depression cases nationwide Investigation of the trend of changes in depression cases over time
Reporting and information methods	Providing public reports with the aim of providing information to youth and adolescents Providing analytical, statistical and research reports as needed Providing visual reports and dashboards

Report users	Adolescents and youth with depression Providing mental health care providers Health centers related to mental health and depression Studies Committee and research related to depression

Findings from model validation and presentation of the final model of the Iranian adolescent and youth depression information system:

In the validation stage, after applying the experts' suggestions obtained from the initial survey and forming an expert panel, all components of the proposed model were confirmed by unanimous agreement among the experts. Figure 1 shows a schematic figure of the approved model of the information system for depression in adolescents and youth in Iran.

Objectives: Collect, record, monitor, and manage information related to depression in the youth and adolescent population to provide appropriate programs and strategies for prevention and treatment in this group of population.

Final Model of the National Information System for Depression in Adolescents and Youth in Iran

is no national and integrated information system in Iran for collecting, recording, monitoring, and managing information related to depression among adolescents and youth. Therefore, in this study, a national model of the depression information system in adolescents and youth for Iran is presented as a strategy to improve the state of depression in this age group by studying related systems in selected countries and the needs of the country.

The national model of the depression information system for adolescents and youth in Iran was divided into two main parts of structural components and key processes after conducting comparative studies in selected countries (Denmark, the United States, China, India, Indonesia) and based on the organizational structure of the health system in Iran and applying the opinions of relevant experts.

From a structural perspective, the first step in planning to design such a system is to determine the institution that owns and is the main custodian of the system. Considering the experiences of different countries and considering the country's conditions, in the proposed model of this study, the Mental Health

Department of the Ministry of Health and Medical Education was designated as the main supervising and responsible organization for the implementation of the National Depression Information System in Adolescents and Youth for Iran.

Structurally, there are different monitoring systems and data sources in the countries studied, depending on the activities of participating organizations and centers for depression-related systems. In the proposed model of the present study, monitoring centers and databases are determined as follows: establishing a monitoring center for the National Depression Information System and Database in the Mental Health Department of the Ministry of Health and Medical Education, the Information Technology Infrastructure Management Center for the National Depression Information System in Adolescents and Youth in the Deputy for Technology of the Ministry of Health and Medical Education, and also establishing a relevant database in each of the relevant centers.

One of the key components that has been considered in the processes section of the depression information system model is the minimum data set. Minimum data sets are a standard tool for continuous and quality data collection that ensures accurate and correct access to health data [27, 28].

Effective and efficient data management as well as information monitoring by information management systems lead to the production of quality, accurate data and timely exchange of data with related organizations [26]. Poor quality data can lead to incorrect clinical decisions, reduced patient safety, and increased health care costs [29]. To ensure the quality of information, various methods of data quality control are provided in the proposed model, including checking duplicate cases, checking incorrect, missing, irrelevant, and inappropriate information, checking medical records, and final review before analysis.

Data exchange in the studied countries is presented in the form of linking databases to each other and sending information. In the proposed model of the present study, online sending of information from information systems in urban centers to information systems in provincial and national centers is also provided.

Given the rapid increase in data in the health sector, data analysis is of great importance. Data analysis helps to make more informed decisions by identifying patterns and trends, improve patient outcomes, and optimize resources. It can also identify at-risk populations and design more effective interventions [30].

In the proposed model, data processing includes calculating descriptive statistical indicators based on variables, statistical analyses of the state of depression, calculating the spatial distribution of depression cases across the country, and examining the trend of changes in depression cases over time.

Reporting allows for comparison of data at different levels for informed decision-making and appropriate actions by physicians and health policymakers. Information systems enable accurate reporting and reduce reporting errors [31, 32]. Various methods for reporting were announced in studies of selected countries. In the proposed national model of the depression information system, presenting information in the form of general reports, visual analysis, and dashboards were presented and confirmed as reporting methods.

Therefore, the proposed model in this study is a comprehensive and optimal tool for managing data related to depression in adolescents and youth, and the results of this model can pave the way for implementing a local depression information system for adolescents and youth in the country. Given that many low-income and less developed countries are not covered by a depression information system, it is suggested that these countries take the lead by providing a national model for a depression information system as the first step in expanding the universal coverage of information systems.

Conclusion

By implementing the National Depression Information System in Adolescents and Youth, systematic access to accurate data and statistics related to depression in this population group will be provided. This system can provide the necessary basis for effective decision-making by policymakers and health managers in the field of resource allocation, planning preventive and therapeutic interventions, and monitoring the status of depression in adolescents and youth at the national level. In addition, creating a comprehensive database of data and information related to depression can be used as a scientific and reliable source for researchers and research centers and provide the basis for conducting specialized studies in clinical and epidemiological fields. Considering the high prevalence of depression in Iran and the need to design and develop such a system, the model proposed in the present study can provide an appropriate information infrastructure for the design and implementation of the National Depression Information System in Adolescents and Youth in Iran.