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Mental healthcare systems research during COVID-19: Lessons for shifting the paradigm post COVID-19

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ABSTRACT

The mental health effects of the Covid-19 pandemic across the globe have been significant, are ongoing, and will persist for a long time. Mental healthcare systems (MHS) to address these effects have been stressed beyond their limit. They have had to: (a) sense the developments and respond to the changing needs quickly, (b) be agile in obtaining feedback and learning from it in very short cycle times, and (c) immediately integrate their personal local experience, the reported global experience and translate the learning to practice. This intense learning cycle has spawned an enormous corpus of research on MHS during COVID-19 and shifted the paradigm of research. Lessons from the paradigm shift should be embraced and normalized in the roadmap for MHS research post COVID-19. This paper presents an ontology of MHS as a framework to systematically: (a) visualize in structured natural-English the dimensions, elements, and narratives of MHS research, (b) map the emphases and gaps in the research during COVID-19, and (c) develop a roadmap to shift the future research paradigm.

1. Introduction

A mental healthcare system (MHS) consists of a set of interconnected functions that must operate together to be effective. Despite the prevalence of mental health conditions needing care, many countries' MHS are inadequate to provide the requisite services (World Health Organization, 2009). In most countries, especially those with low- and middle-income economies, there is an enormous gap between those who need mental healthcare and those who receive it (Rathod et al., 2017). Despite efforts to promote and integrate the functions through partnerships among service providers and recipients of MHS services, the systems in most countries continue to be disjointed. In addition, there are fragmented professional groups working in silos with their own models of mental healthcare (Rosenberg & Hickie, 2013). The results of the above have been inefficiencies, service gaps, and compromised mental health outcomes.

In the above global scenario, the COVID-19 pandemic brought about a shift in the MHS, particularly in the system core processes. COVID-19 prompted efforts to adapt delivery of mental healthcare to the heterogeneous health systems worldwide (Moreno et al., 2020). In a major paradigm shift, the delivery systems moved towards reliance on digital solutions (Mahmood, Hasan, Carras & Labrique, 2020). While mental health professionals dealt with the impact of the pandemic in their practice, research indicated the need to develop programmes and policies with good leadership to implement them (Maulik, Thornicroft & Saxena, 2020). COVID-19 highlighted the need to develop a system that is comprehensive, integrated and that comprises intersectoral alliances, has deliverables that are based on research and evaluation, and protects the rights of the individuals (Maulik et al., 2020). The importance placed on mental health during the pandemic brought the need for increased financing along with the need to have insurance mechanisms for financial support. However, budget allocation for beneficiaries such as migrant workers, elderly, and vulnerable populations and their mental healthcare remained neglected (Yip, Ge, Ho, Heng & Tan, 2021).

Prior to 2020, mental health services were overly strained (OECD, 2021). Efforts to address the mental health impact of the pandemic shifted to specialized local care that allowed local available resources to be utilized. In this, community-based support services played an important role (Mahajan et al., 2019). With the varied impact on mental health of diverse population groups, providing services that are both accessible and equitable became essential. Consequently, there was a shift to digital mental healthcare. Such care made possible interventions in India despite having lower resource sites. Several tertiary care centers regularly made use of teleconsultations to address mental health issues. Tele-based emotional support for older adults were found to be an effective substitute for in-person meetings (Bar-Tur et al., 2021). Further, civil societies set up tele-consultations in cases of emergency (Tata Institute of Social Sciences, 2020). Due to restrictions on move-

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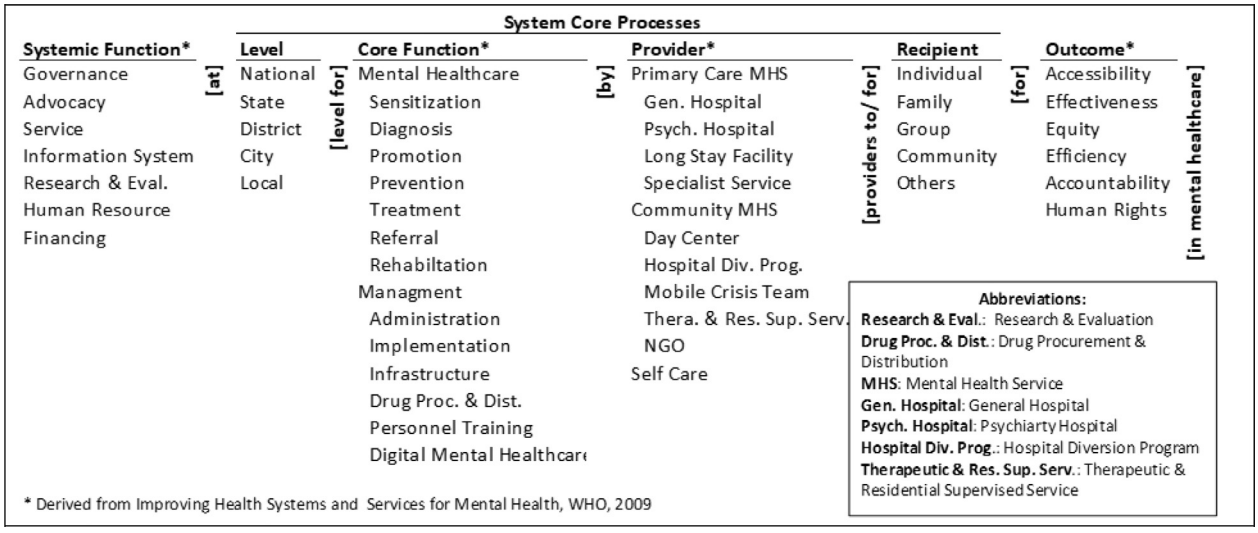

Fig. 1. Ontology of mental healthcare systems (MHS).

ment, access to psychotropic medications needed a robust supply chain and the ability to purchase medicines was compromised and became a critical issue for MHS (Maulik et al., 2020).

The complexity of mental healthcare requires a MHS that can address the problem systemically and systematically. It should be able to (a) sense the needs, (b) respond to the needs, (c) obtain feedback, (d) learn from the feedback, and (e) repeat the cycle periodically. The research on MHS to the crisis of COVID-19 can help shift the paradigm underlying the design of these systems. The paper will describe: (a) an ontology of MHS, (b) map the research in response to COVID-19 onto the ontology, (c) highlight the emphases and gaps, (d) discuss the paradigm shifts due to COVID-19, and (d) propose a roadmap to institutionalize the paradigm shift in the future.

2. Ontology of a mental healthcare system (MHS)

Mental healthcare is a complex problem. The scale of the problem is large, its scope wide, and its severity varied (Chandra, Ramaprasad & Singai, 2020). An ontology is a framework to deconstruct the problem's complexity in a way it can be easily understood and managed.

An ontology of MHS is presented in Fig. 1. It specifies the six dimensions of the system (represented by the six columns viz: systemic functions; level; core function; provider; recipient; and outcome), the elements of each dimension (presented as a taxonomy within the column), and together the boundaries of the system. It is a hierarchical representation and visually represents the complex combinations of pathways (lateral and associated) to address the mental health problem. The visualization is in structured natural-English, making it easy to read (refer the illustrative pathways in the next section for reading ontology) and understand by experts and novices. By natural English language, we mean that the ontology has the characteristic of well-established pattern of communication and classification of words in terms of verbs, nouns, and adjectives. Thus, an ontology is a combinatorial, visual, natural English representation, which can be translated into other languages. The application and development of the ontology follows the description of the logic and process as put forth by Ramaprasad and Syn (2015, 2014). An ontology represents the conceptualisation of a given domain (i.e., the domain of mental health system in the paper). In addition, an ontology helps to organize terminologies and taxonomies in a logical manner. It is like a 'Google Map' using which one can see all the 'roads' in the system to address the mental health problem. We describe the dimensions and the corresponding elements below.

The rightmost column of the ontology lists the desired outcomes (WHO 2009) of the MHS. They are (a) accessibility, (b) effectiveness, (c) equity, (d) efficiency, (e) accountability, and (f) human rights in mental healthcare. The systemic functions are mentioned in the left most column, namely: (a) governance, (b) advocacy, (c) service, (d) information system, (e) research and evaluation, (f) human resource, and (g) finance. The functions (WHO 2009) determine the outcomes via the system's core processes. These are the input and output dimensions of a MHS.

The core processes are complex and intricate. They are defined by the level of the system, core mental healthcare functions, their providers, and their recipients. These four dimensions form the middle four columns of the ontology. The MHS must perform these core functions by/through the providers to/for the recipients. The core functions (WHO 2009) are broadly mental healthcare and management - each of these has many subfunctions. Mental healthcare subfunctions include sensitization, diagnosis, promotion, prevention, treatment, referral, and rehabilitation. Management subfunctions include administration, implementation, infrastructure, drug procurement and distribution, personnel training, and digital mental healthcare. The providers may be primary care mental healthcare service providers, community mental healthcare service providers (both represent formal and informal mechanisms), or oneself. There are many subcategories of the first two. The subcategories of primary care mental health service providers are the following: general hospital, psychiatry hospital, long stay hospital, and specialist service; that of community mental health service are the following: day centers, hospital diversion program, mobile crisis team, therapeutic and residential supervised service, and NGO. The recipients of mental healthcare include the (a) individual, (b) family, (c) group, (d) community, and (e) others not mentioned in the taxonomy. The scope of the system can range from the national (macro) level to a local (micro) level.

In sum, the ontology encapsulates $5 \times 13 \times 10 \times 5 = 3250$ system core processes. In combination with the seven systemic functions and the six outcomes it denotes $7 \times 3250 \times 6 = 136{,}500$ pathways for mental healthcare delivery. Of these, three illustrative pathways are:

1. Governance at national level for sensitization of mental healthcare by general hospital primary care mental health service providers to individuals for accessibility in mental healthcare.
2. Information system at state level for promotion of mental healthcare by long stay facility primary care mental health service providers to groups for efficiency in mental healthcare.
3. Finance at local level for digital mental healthcare management by self-care providers to others for respect in human rights in mental healthcare.

The statements are awkward because they are in structured natural English, derived directly from the ontology. The awkwardness can be removed by restating in natural English. Each pathway in the ontology may connote many potential instantiations. Similar to the illustrative pathways mentioned above, an instantiable pathway is a concatenation of an element from each column (dimensions) of the ontology with adjacent connecting words/phrases. Thus, the total number of instantiable pathways may be a multiple of the 136,500 in the ontology. We study the research on MHS during COVID-19 through the lens of the ontology.

3. Method

The existing global literature from World Health Organization's global research database on coronavirus disease (COVID-19) database (WHO, 2022) was mapped onto the ontology to visually synthesize the state-of-the-research on MHS during the pandemic. The monad map and the theme map were generated from the mapping. The maps visualize the landscape of the domain of MHS research and its highlights. The corpus of research was created by searching the WHO database on TITLE-ABSTRACT-SUBJECT of the articles indexed in the database.

We experimented with several search terms. The first search was conducted on May 26, 2022, at 12:50 PM IST using the string TITLE-ABSTRACT-SUBJECT (mental AND healthcare AND system). The date range to get the corpus was selected from January 1, 2019, to May 25, 2022 (please note that the date range denotes period prior to and during the onset of COVID 19). The resulting items included different document types such as articles, reviews, notes, letters, conference papers, editorials, and other types of documents.

In the first iteration we filtered the results according to relevant subjects namely:"Mental Health" OR "Mental Health Service" OR "Mental Disorder" OR "Stress, Psychological" OR "Anxiety" OR "Social Isolation" OR "Burnout, Professional" OR "Occupational Stress" OR "Psychosocial Support System" OR "Adaptation, Psychological" OR "Psychiatry" OR "Stress Disorders, Post-Traumatic" OR "Depression" OR "Suicide" OR "Cognitive Dysfunction" OR "Geriatric Psychiatry " OR "Psychotherapy" OR "Community Mental Health Service" OR "Hospitals, Psychiatry" OR "Behavioral Symptom" OR "Cognitive Behavioral Therapy" OR "Psychosocial Intervention" OR "Psychotic Disorder" OR "Psychiatric Nursing" OR "Psychology, Clinical" OR "Schizophrenia" OR "Alzheimer Disease" OR "Autistic Disorder" OR "Behavior Therapy" OR "Bipolar Disorder" OR "Depressive Disorder" OR "Anxiety Disorder" OR "Preventive Psychiatry" OR "Psychological Test".

During the second iteration, we further filtered the results to the document type 'article' which yielded 356 articles for the first round of corpus selection. Consequently, to update the corpus, we adopted the same search strategy and filtering process and conducted another search on the July 10, 2022, at 16:05 PM IST with the date range from May 26, 2022, to July 10, 2022, which yielded six articles. Fig. 2 provides a detailed representation of the search process and results followed using the PRISMA (Liberati et al., 2009) reporting guidelines.

In the first step, we identified 356 records in WHO database from the first search and added six articles after the second search. The screening was conducted across different stages. In the first stage the 362 articles were screened, and 7 duplicates were excluded. In the second stage of screening the 355 articles based on relevance, 89 articles were excluded leaving 266 articles to check for eligibility. In the last stage, 56 articles without abstracts were excluded from the corpus. The remaining 210 articles were included in the final mapping. All the 210 articles were journal articles and were considered for coding.

The title, abstract, of the final 210 included articles were downloaded and imported into an Excel spreadsheet for mapping. The reference management software Zotero (Corporation for Digital Scholarship, Vienna, VA, USA) was used to store the corpus of included articles. The final corpus of 210 articles was coded onto the ontology by two of the authors. The mapping is binary—either present (1) or absent (0)—and not weighted. Only the dimensions and elements explicitly articulated were mapped. The mapping of the articles went through two iterations by two of the authors to ensure its reliability and validity. After the rounds of individual mapping, the mappers discussed the discrepancies in their mapping and arrived at a consensus for the final mapping. The glossary in Appendix A was used to assure the validity of the mapping.

4. Results

We present the monad map (Fig. 3) and theme map (Fig. 4) below. They are described next.

4.1. Monad map

The monad map in Fig. 3 numerically and visually summarizes the frequency of occurrence of each dimension and element of the ontology in the corpus. It is a combination histogram of each dimension and its elements in the corpus. The histograms' organization mirrors the ontology. The number adjacent to the dimension name and the element is the frequency of its occurrence in the 210 journal abstracts that were reviewed and mapped. The bar below each element is proportional to the frequency relative to the maximum frequency among all the elements. Since each abstract can be coded to multiple elements of a dimension, the sum of the frequency of occurrence of elements may exceed the frequency of occurrence of the dimension to which the elements belong.

The dominant focus is on the core function (187) dimension, followed by systemic function (115), recipient (71), outcome (69) and provider (48). There is less focus on level (24). The research articles cover most of the core function elements with widely ranging emphases. The dominant focus is on management-digital mental health (89) followed by moderate focus on mental health-diagnosis (68) and mental health-treatment (65). There is some emphasis on management-implementation (47), management-administration (38), management-personnel training (27) and mental health-prevention (24). There is least focus on mental health-sensitization (19), management-infrastructure (13), mental health-promotion (10), mental health-referral (6) and mental health-rehabilitation (6). There is no emphasis on management- drug procurement and distribution (0).

There is dominant focus on service (76) as a systemic function. There is moderate emphasis on research and evaluation (23) and financing (23) as systemic functions. There is little emphasis on governance (14), human resource (14), advocacy (12) and information system (10) as systemic functions.

There is significant emphasis on individual (43) as a recipient. There is moderate emphasis on family (15), group (15) and community (15) as recipients. There is lesser emphasis on others (5) as recipients of mental healthcare.

There is dominant emphasis on accessibility (40) as an outcome in mental healthcare. There is moderate emphasis on effectiveness (30). There is little emphasis on efficiency (13). There is least emphasis on equity (6), accountability (3) and human rights (2) as outcomes of mental healthcare.

Amongst the providers, there is dominant emphasis on primary care-mental health services- general hospital (18), self-care (15) and primary care-mental health services-psychiatric hospital (13). There is least emphasis on primary care-mental health services- specialists service (2), community mental health services-hospital division program (2), community mental health services-therapeutic and research supervised service (2), community mental health services- NGO (2) and community mental health services-day center (1). There is no emphasis on primary care-mental health services-long stay facility (0) and community mental health services-mobile crisis team (0).

The dominant focus is on national (12) and local (10) levels of mental healthcare. There is moderate emphasis on state (8) and lesser emphasis on district (2) and city (2) amongst the levels.

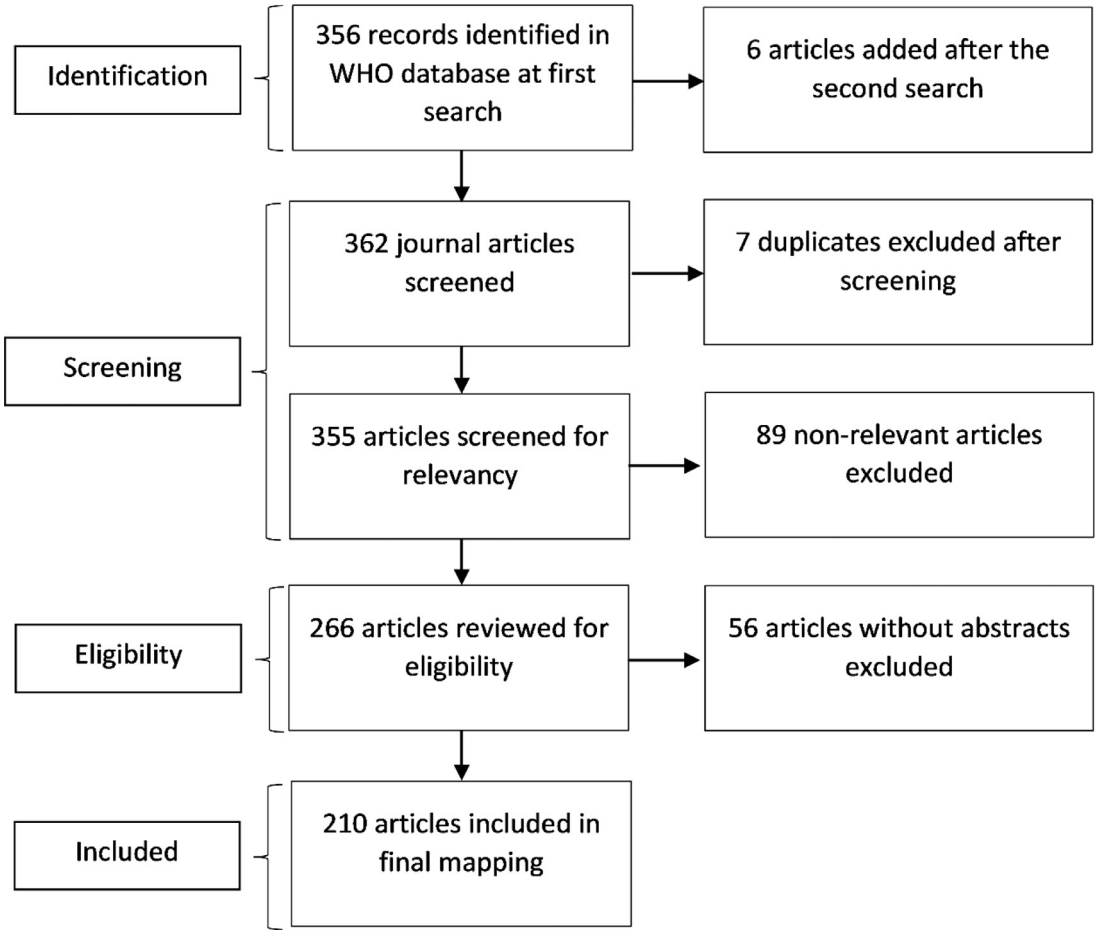

Fig. 2. PRISMA flow diagram of mental healthcare systems corpus.

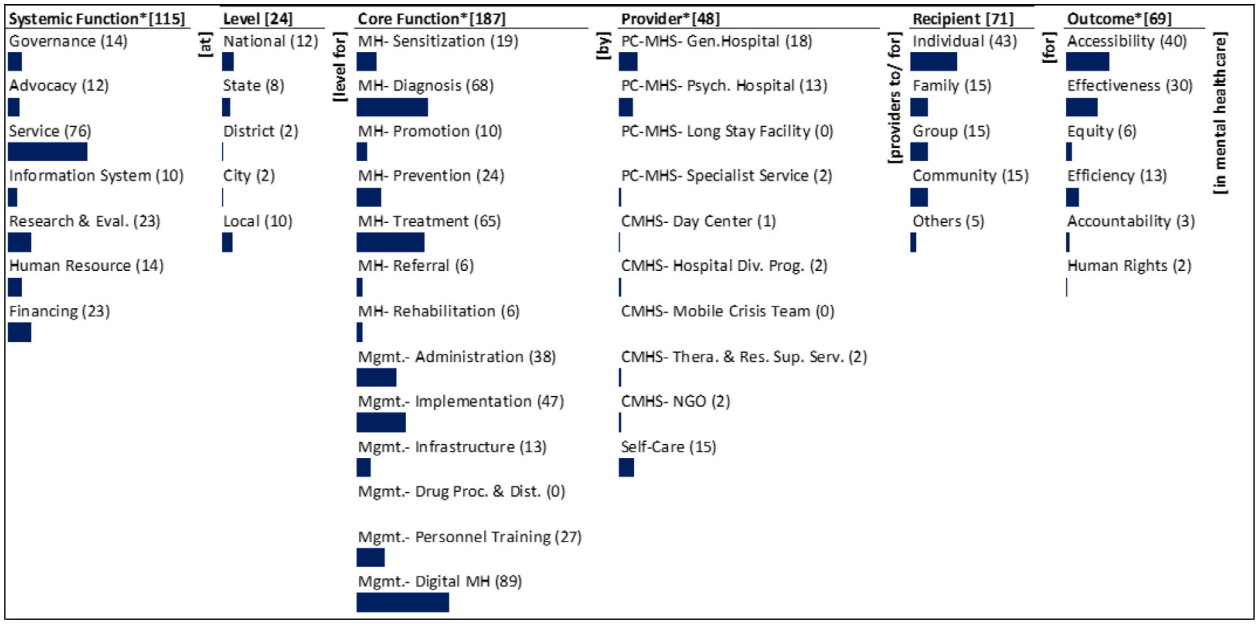

Fig. 3. Monad map of research on mental healthcare systems during COVID-19.

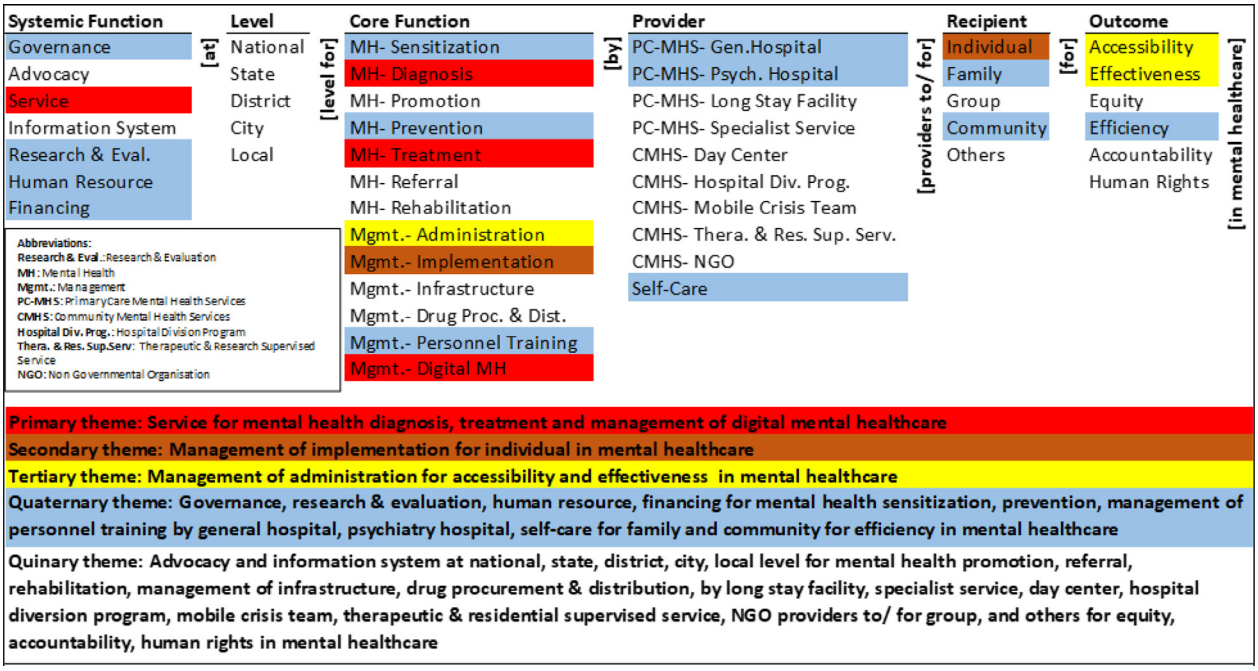

Fig. 4. Theme map of research on mental healthcare systems during COVID-19.

4.2. Theme map

The theme map visually summarizes the co-occurrence of elements of the ontology in the population of articles. Some of the co-occurrences can be intuited from the monad map – there is high likelihood of co-occurrence of the high-frequency elements. The theme map is based on a mathematical computation of the occurrences and their visual representation. Hierarchical cluster analysis was done using SPSS (Statistical Package for Social Sciences; IBM: Chicago, IL, USA) with simple matching coefficient (SMC) as the distance measure and the nearest-neighbor aggregation procedure. The detailed rationale for the choice of the clustering method and the presentation of the results are given in La Paz, Merigó, Powell, Ramaprasad and Syn (2019) and Syn and Ramaprasad (2019). The five themes represent the five equidistant clusters in the dendrogram of the agglomeration (Syn & Ramaprasad, 2019). The colors in Fig. 4 highlight the elements of the five themes.

The primary research theme (in red) is service for mental health diagnosis, treatment, and management of digital mental healthcare. It has three short segments of many potential pathways for MHS in the ontology. The potential pathways may include different levels, providers, recipients, and outcomes. The primary research theme is two dimensional and four leveled – it is simple.

The secondary research theme (in brown) is management of implementation for individual. The potential pathways that may include this segment may have different systemic functions, core functions, providers, and outcomes. The secondary research theme is two-dimensional and one levelled – it too is simple.

The tertiary research theme (in yellow) represents management of administration for accessibility and effectiveness in mental healthcare and hence has two segments. The theme lacks systemic connections among other dimensions of MHS. The connections may have been with dimensions of systemic function, level, provider, and recipient. The theme is two dimensional and two-leveled – it too is simple.

The quaternary research theme (in blue) represents governance, research & evaluation, human resource, financing for mental health sensitization, prevention, management of personnel training by general hospital, psychiatry hospital, self-care for family and community for efficiency in mental healthcare. It includes 72 long segments of many potential pathways in the ontology. The theme covers five of the six dimensions in the ontology, except the level dimension. The theme is five dimensional and four-leveled – it is complex.

The quinary research theme (no color) summarizes the absence in the research corpus. Advocacy and information system at national, state, district, city, local level for mental health promotion, referral, rehabilitation, management of infrastructure, drug procurement & distribution, by long stay facility, specialist service, day center, hospital diversion program, mobile crisis team, therapeutic & residential supervised service, NGO providers to/ for group, and others for equity, accountability, human rights in mental healthcare are all not part of any theme. The theme highlights the absence of different levels that could be part of MHS. It excludes advocacy and information system in the dimension of systemic function. Amongst the core functions, the theme highlights the exclusion of mental health promotion, referral, and rehabilitation, and management of infrastructure, drug procurement and distribution. Last, the theme highlights the exclusion of a variety of providers (long stay facility, specialist service, day center, hospital diversion program, mobile crisis team, therapeutic and residential supervised service, and NGO), recipients (groups and others), and outcomes (equity, accountability, and human rights) in MHS research during COVID-19.

Overall, the themes are in decreasing order of dominance in the research – the primary theme is the most dominant and the quinary theme is absent. The three most dominant themes are simple; they are one- to two-dimensional, and two- to four-leveled. The fourth theme is complex. The quinary theme is a vast complex domain across many dimensions and levels that is yet to be researched.

5. Discussion

The ontology-based analysis of the literature corpus on MHS during COVID-19 shows the selectivity and segmentation in its approach. The monad map shows that the dominant focus of the research is on core function, followed by systemic function, recipient, outcome, provider, and level in descending order. While the literature covers all the dimensions, the coverage of the elements under each dimension is not systematic. It neglects crucial elements that could play a key role in creating an

integrated and holistic MHS. The emphases and gaps in each dimension are discussed below.

5.1. Core function emphases and gaps

Amongst the core functions there is significant emphasis on management of digital mental health. There is moderate emphasis on mental health-diagnosis, mental health-treatment, and management-implementation. There are lesser emphases on elements like management- administration, management-personnel training, mental health-prevention, mental health-sensitization, management-infrastructure, mental health-promotion, mental health-referral, and mental health- rehabilitation. There is no emphasis on management-drug procurement and distribution, which was a critical gap MHS during COVID-19 (Maulik et al., 2020).

5.2. Systemic function emphases and gaps

Amongst the systemic functions there is dominant emphasis on service. To foster effective service, United Kingdom and Czech Republic opened Out Patient Department for mental health patients (OECD 2021). Other systemic functions like research and evaluation, financing, governance, human resource, advocacy, and information system received lesser emphases.

5.3. Recipient emphases and gaps

Amongst the recipients of mental healthcare, individuals received the greatest emphasis. Ireland provided person-centered care as part of its policy priority for assisting in delivery and evaluation of services (OECD 2021). A few recipients like family, group and community have received lesser emphases. Other recipients (e.g., vulnerable population) received very little emphasis. This contrasts with the need for ensuring continuity of care (through telehealth) for children with neurodevelopmental disorder during home confinement which is critical for decreasing predicted externalizing behaviours (Bentenuto, Mazzoni, Giannotti, Venuti & de Falco, 2021).

5.4. Outcome emphases and gaps

Amongst the outcomes, accessibility received the greatest emphasis. While there is moderate emphasis on effectiveness of mental healthcare; other elements like efficiency, equity, accountability, and human rights had very little emphases.

5.5. Provider emphases and gaps

Amongst the providers, there is heavy emphasis on primary care of mental health services by hospitals (general and psychiatric). For instance a total of at least 89 wards in France were specifically dedicated to patients with COVID-19 needing psychiatric hospitalization to enable dual care of general medicine and psychiatry (Bocher, Jansen, Gayet, Gorwood & Laprévote, 2020). Self-care received less emphasis. Other providers of mental healthcare like hospital division program, therapeutic and research supervised service, specialist service, NGO, and day center received very little emphasis. Long stay facility and mobile crisis team as providers of mental healthcare were absent in the corpus.

5.6. Level emphasis and gaps

Amongst the levels, the national level of mental healthcare got the greatest emphasis. Local and state levels have received moderate emphases. District and city levels of mental healthcare have received the least emphases.

5.7. Themes emphases and gaps

Thematically, the emphases and gaps highlight the segmented (covers a subset of dimensions), selective (covers a subset of elements in a dimension), and siloed (overlooked entire dimensions) logic in the corpus. While the corpus covers most of the elements of the framework as shown in Fig. 3, the thematic coverage is not systemic.

The primary theme highlights the emphasis on service for mental health diagnosis, treatment, through digital mental healthcare. Research suggests that healthcare workers play a vital role in service delivery and they should ensure continued follow-ups, either through in-person or telehealth appointments, for timely identification of symptoms related to anxiety and depression and act accordingly (Van Hees et al., 2020; Xiang et al., 2020). The primary theme is not linked to any level, provider, recipient, or outcome dimensions of the ontology. However, the COVID-19 pandemic has forced nations to be innovative and adaptive by using digital measures for diagnosis and treatment in mental healthcare. This has been a significant shift in mental healthcare post the onset of COVID-19. The expansion of tailor-made digital resources has been a catalyst for distant service delivery for individuals and local populations, enhancing resilience (Arevian et al., 2020; Blake, Bermingham, Johnson & Tabner, 2020; Wright & Caudill, 2020 Mar), improving access, and cost efficiency of treatment (Parikh et al., 2021). For instance, Text4mood program aided supportive text message services for residents in Alberta (Agyapong VIO 2020 Apr); PsyCOVID-19 in France (Al Joboory, Monello, Soulan, Fernândez & Bouchard, 2020) for teleconsultations; mobile health apps for resilience for health workers and patients (Alexopoulos, Hudson & Otenigbagbe, 2020); and online support for visually impaired children (Battistin et al., 2021) provided mental health support during isolation, quarantine, and lockdown phases of the COVID-19 pandemic.

The secondary theme highlights the management of implementation for individuals in mental healthcare. Considering the individual as a recipient of care, the corpus particularly highlights the need for interventions for mitigating the rising incidents of suicide (Abi Zeid Daou, Rached & Geller, 2021) due to COVID-19. There is greater need for implementation of interventions for healthcare students (Basheti, Mhaidat & Mhaidat, 2021) to aid coping and optimize their learning process; psychological support services for clinicians (Bansal et al., 2020), and for people with psychopathology and their families (Buono et al., 2021), and psychiatric care for prison inmates (Fovet et al., 2020) in France are all well-articulated across the literature. Further the research also highlights the importance of long term interventions for healthcare workers (Carmassi et al., 2021) in order to investigate their psychopathological burden due to COVID-19. On the other hand, implementation of interventions to improve social capital, coping, resilience building (Aluh & Onu, 2020) for individuals, groups, family, and community is critical for promoting psychosocial wellbeing and foster a robust MHS.

The tertiary theme highlights the importance of management of administration for accessibility and effectiveness in mental healthcare. Mechanisms to ensure continued follow-up (Van Hees et al., 2020) for timely identification, improve access (Parikh et al., 2021), integration of mental health professionals in to public health insurance systems (Scharf & Oinonen, 2020 Aug), and insights from clinical practices (Weiner et al., 2020) can lead to creation of a robust MHS, especially in terms of administration. Further there is a need for enabling supporting structures of accountability, outcome measurement, human resources and financing (Alegría et al., 2021) that are pre requisites for providing effective, accessible and equitable mental healthcare.

The quaternary theme is less segmented and selective compared to the other themes. Though it is spread across most of the dimensions, it excludes level of MHS. The theme covers significant systemic function in terms of governance, research and evaluation, human resource, and financing. Its highlights the importance of these functions for mental health sensitization, prevention, management of personnel training by general hospital, psychiatry hospital, self-care for family and community

for efficiency in mental healthcare. Recruitment of qualified human resource and their training is critical for effective mental healthcare. For instance, educational programs may aid in reducing the gaps between practitioner's knowledge and improve patient care (Vilovic et al., 2021). Further, it is specifically important to engage in research and evaluation of the interventions taken as a reaction to COVID-19. Such evaluations will aid in appropriate planning, peer review and standard practices for reporting, guidance and duration of follow-up (Pollock et al., 2020). The COVID-19 crisis has uncovered that our regular care systems are not capable to meet the needs of the autism communities (Ameis, Lai, Mulsant & Szatmari, 2020). Thus from a governance perspective, there is an important need to enhance the capacity of the primary care for mental healthcare (Ashcroft et al., 2021), financial, human resources and administrative support (WHO 2020), continued care for patients at the community level (Amerio et al., 2020) and strategies that aim to improve resilience and outlook of the providers of care(e.g. general physician) is critical to ensure their wellness (Bansal et al., 2020) and adaptability.

The quinary theme highlights considerable systematic oversights across the dimensions and elements of the ontology. It highlights the exclusion of governance functions in terms of advocacy and information system across different levels (national, state, district, city, local) for engaging in mental health promotion, referral or rehabilitation and management of infrastructure, drug procurement and distribution by primary care and community driven mental health services (e.g., long stay facility or mobile crisis team), and NGOs for groups. It highlights the lack of priority of equity, accountability, and human rights in mental healthcare.

Activities that promote and protect mental health need coordinated actions amongst the providers of care (e.g., timely communication between health workers and health institutions) to ensure sustained and comprehensive mental healthcare (Cantor-Cruz et al., 2021). For instance, if India must strengthen its public mental healthcare system it should devise interventions and policy deliberations beyond the scope of the National Mental Health Policy −2017 (Mahajan et al., 2019). Likewise, inadequate infrastructure and resources has affected for an immediate reorganization of mental healthcare in France (Chevance et al., 2020). While there is need for a flexible MHS that includes peer and organizational support for the frontline workers, absence of research studies that comprehend the structural and systemic barriers to access psychosocial support (Billings et al., 2021) remains a significant gap in the literature. Organizational measures in terms of periodical monitoring, inclusion of psychologists with specialization in crisis-management (Rodríguez-Rey, Garrido-Hernansaiz & Bueno-Guerra, 2020), and integration of technology-driven care could provide timely support for frontline institutions and improve mental health outcomes (Iorfino et al., 2021).

In summary, the primary theme focuses on services for mental health diagnosis, treatment, and management by digital mental healthcare. The primary focus of the research articles was on identification, assessment of mental health concerns after the onset of the COVID-19 pandemic. In addition, most of the research articles have concentrated on the usage and preferences of using digital platforms by the recipients of mental healthcare. However, the efficacy of such shift in mental healthcare measures has not been the focus of the current research. While telepsychiatry (via tele-medicine and tele-counselling) can aid mental healthcare by improving access and reducing cost, the evaluation and assessment (Shore, Hilty & Yellowlees, 2007) of telepsychiatry measures is critical for creating a comprehensive mental healthcare system.

5.8. Paradigm shift

The paradigm for MHS research during COVID-19 dominantly emphasizes management of digital mental healthcare service for diagnosis and treatment of mental health. It emphasizes the systems' management of implementation to provide individual care. It also addresses the administration of the system for accessibility and effectiveness. Last, it covers governance, research & evaluation, human resources, and financing: (a) for mental health sensitization, prevention, management of personnel training, (b) by primary care general hospital, psychiatry hospital, and self-care, (c) for family and community, (d) for efficiency in mental healthcare.

The paradigm is a product of the challenge posed by COVID-19 and highlights a major shift due to it. Implementation of digital mental healthcare service for diagnosis and treatment of individuals and administering them for accessibility and effectiveness became the dominant drivers. This shift towards increasing usage, acceptability, and reliance on digital interventions and devices for accessing many health services was accompanied by rapidly evolving policies and implementation of the practices such as telepsychiatry, tele-consultations, telemedicine, and health apps (Anand, Verma, Aggarwal, Nanjundappa & Rai, 2021; Dandona & Sagar, 2021; ETI, PATH. 2021). Additionally, enablers for integration of promotive, preventive, and curative mental healthcare interventions exist especially as mental healthcare is increasingly being recognized as an integral part of comprehensive primary healthcare. The implementation gap of several mental health policies in primary healthcare has been due to the lack of financial and human resources, mental health services, public mental health knowledge, and mental health literacy (Campion, 2013).

Treatment efficacy in terms of rapport building, therapeutic relationship, privacy and safety concerns were some the barriers that were addressed as part of the telehealth approaches during the pandemic (Reay, Looi & Keightley, 2020). Further there is a need for strategic planning for sensitization, screening, early detection, and treatment, and developing strong referral systems between providers of mental healthcare services. Several countries that have implemented mental health policies into their public health systems are not implemented to the required scale. Due to these factors, there is systematic discriminatory attitude towards mental healthcare (Campion, Bhui & Bhugra, 2012) The shift to digitalization of mental healthcare was welcome during the pandemic, in the absence of the ability to personalize it due to social-distancing requirements. For instance, mobile text messages (in terms of Short Message Services) was found to support culturally acceptable mental health promotion and preventive services for young women located in urban slums of India (Chandra, Sowmya, Mehrotra & Duggal, 2014). In addition, telemedicine has supported remote clinical care, health administration and sensitization (Arafat, Zaman & Hawlader,).Technology are utilized in tele mental health, development of mobile applications, online psychological assessment and interventions, training of mental health professionals and information dissemination in countries like united states, united kingdom and India (Basavarajappa & Chand, 2017). Further, the need for development, management, and deployment of ethical digital mental health solutions for addressing the mental health needs of young people has been well articulated (Wies, Landers & Ienca, 2021). The pandemic helped overcome, even if temporarily, many of the barriers to digitalized mental healthcare. It also demonstrated the accessibility and effectiveness of such healthcare. It represented a shift in the traditional paradigm of mental healthcare and has paved way for provision of mental healthcare through online services. However, post-COVID-19 its institutionalization may be uncertain. Despite the numerous barriers (Witteveen et al., 2022), Implementation of tele mental health allowed some continuing support to the majority of service users during the COVID-19 pandemic and has value in an emergency situation (Appleton et al., 2021)

The digitalization of diagnosis and treatment of mental healthcare during COIVD-19 could be used as a segue to shift the paradigm in the following ways. We shall describe them briefly below.

First, digitalization can be adapted and extended to the other core functions of mental healthcare – sensitization, promotion, prevention, referral, and rehabilitation. In doing so, one may seek to digitalize the full cycle of mental healthcare. For sensitization and promotion, studies have shown the effectiveness of SMS text-

messaging for effective promotion of treatment adherence and attendance at appointments (Naslund et al., 2017). For instance, an exploratory study results depicted the feasibility and acceptability of SMS text-messaging to promote positive mental health in young women residing in urban slums of Bengaluru, India (Chandra et al., 2014). Further, tele-based emotional support for older adults could substitute for in-person meetings (Bar-Tur et al., 2021). Teleconsultation has also been a feasible model to reduce referral rates to different groups (Kale et al., 2016). Technology has become an imperative part of rehabilitation and the evolution of assistive technologies for mental health in terms of web-based assessment and intervention, virtual reality, and mobile applications (Tsang & Lin, 2022) have digitized mental healthcare. For instance, tele-based psychotherapy has evolved as an effective mode of service delivery across metropolitan and rural settings in Australia (Reay et al., 2020) during the COVID-19.

Second, digitalization could immensely aid and be aided by its integration with all the mental healthcare management functions. The digitalization of the core functions of mental healthcare and its management could symbiotically be deployed to improve the presently less-emphasized outcomes – equity, efficiency, accountability, and human rights. Equity and efficiency issues are now being targeted through apps for peer support and medication adherence (Hirschtritt & Insel, 2018). Today there are digital psychotherapies that are available directly to consumers with the help of software and devices, and there is a need for these to have accountability as well (Wies et al., 2021).

Third, digitalization can be an effective tool for targeting family, group, community, and other recipients. Techniques that have been used to target these entities in eCommerce, social media, and other channels could be transplanted to MHS, given a well-developed platform. Such targeting could also improve all the outcomes. An AI-powered mental health platform launched by an Indian startup offers assessments and a range of cognitive behavior therapy tools with personalized content and one-on-one support to individuals, corporate clients, and extended support to healthcare workers with free online services post COVID-19. In addition, Roche Diagnostics India launched a mobile app dedicated to support the healthcare professionals' emotional wellbeing (Ang, 2021).

Fourth, the digital platform could be used by the full spectrum of providers instead of the narrow set that have been highlighted in the corpus. Countries like India are developing national digital platforms for managing TB, COVID-19 vaccination, general immunization, and related healthcare challenged. A similar platform can be developed or adapted for mental healthcare. For instance, the Government of India launched "MANAS" platform which is comprehensive, scalable, and a national digital wellbeing platform. It can be extended beyond promotion of positive mental health in the age group of 15–35 years. It can also be integrated with public health schemes like Poshan Abhiyan, National Health Mission, and e-Sanjeevani (Arora, 2021).

Fifth, digitalization can aid growth laterally across each level – national, state, district, city, local, but also integration between levels. Such integration would be aligned with plans to develop national digital healthcare infrastructure in many countries. The need to build stronger information systems for mental health is critical for ensuring services, delivering care, and to make MHS future-focused and innovative (OECD 2019).The Australian government is providing psychosocial support services through a digital platform and offers services like text messaging, telephone, online chat platforms, videoconference, self-help platforms, online group chat, mobile apps before and after the COVID-19 pandemic for addressing the common mental health issues, self-harm, and suicide (Wilson, Moretto, Langbecker & Snoswell, 2020; Zhou et al., 2020).

Sixth, and last, digitalization would be a catalyst for improving all the systemic functions of MHS. Of course, the improvement of information systems will be central to the digitalization drive. It is vital for information systems to gather data across all settings and levels to create a system with multiple data sources that can be linked to community-based interventions to tackle the mental health problems in a cohesive manner, to run predictive models using artificial intelligence, comprehend underlying neurobiological mechanisms, and use innovative digital solutions (Maulik et al., 2020). In addition, digitization could inform healthcare policy makers and healthcare systems about the need for continued financial and administrative assistance for psychiatric physicians and MHS (Bojdani et al., 2020).

In summary, the research on MHS response to COVID-19 may be used to trigger the digitalization of MHS. It would be a paradigm shift but in alignment with the shifts that are taking place in both healthcare and non-healthcare sectors.

6. Conclusion

The onset of COVID-19 pandemic has re-emphasised the need for systematic and systemic MHS. The mental healthcare needs and challenges are many and varied. The severity and prevalence of mental health effects of COVID-19 are varied. The current literature in the domain has been directed towards understanding the nature, prevalence, and assessment of mental health effects on different cohorts of the population. There is absence of a comprehensive management strategy that takes consideration of systemic functions, core functions, provider, and recipients across different levels for designated outcomes in mental healthcare. Most countries have struggled to deliver and evaluate their existing MHS (OECD 2021). Many strategies may be deployed simultaneously, sequentially, or both. The strategies may evolve. Thus, the complexity of managing the problem is combinatorial. Consequently, MHS are complex by necessity – commensurate with the complexity of the problem they must address.

All strategies may not be equally effective. Research is required to discover the effective strategies and reinforce them, the ineffective ones and redirect them, and innovative ones and experiment with them. The roadmap for research must be guided by the systemic framework of the ontology and systematic exploration of the strategies connoted by the pathways. The present state-of-the-research is selective – it does not cover all the elements of the problem, siloed – it emphasizes a few dimensions of the problem, and segmented – it focuses on partial strategies. It is not comprehensive, synoptic, and integrated. Continuation of the present trajectory of research is unlikely to address the problem effectively. The trajectory must be changed. The paper provides a framework and a method to develop an effective roadmap for research to manage an effective MHS.

To the authors' knowledge this is the first attempt to develop such a portrait. It is insightful and shows isolated research efforts that have been carried out across the world to explain the whole state of research in MHS. There is a lack of coordination between the priorities established by the decision-makers and the researchers. For instance, the OECD report titled 'A New Benchmark for Mental Health Systems: Tackling the Social and Economic Costs of Mental Ill-Health' provides a detailed narrative of different strategies introduced by different OECD countries post the onset of COVID-19[20]. Such narratives are not part of the current research. The World Health Organization since its adoption of Mental Health Action Plan 2013–2020 focused on four key objectives: "to strengthen effective leadership and governance for mental health; provide comprehensive, integrated, and responsive mental health and social care services in community-based settings; implement strategies for promotion and prevention in mental health; and strengthen information systems, evidence, and research for mental health." (Saxena, Funk & Chisholm, 2013). The United Nations has articulated the need and implementation of systemic actions by national governments such as, applying a whole-of-society approach to promote, protect and care for mental health, support recovery from COVID-19 by building mental health services for the future, and ensure widespread availability of emergency mental health and psychosocial support (United Nations 2020).

In summary, the results provide a synoptic view of the current direction research has taken with respect to the MHSs. The analysis assists

the decision makers to prioritize different strategies and set agendas on the less explored but highly relevant and impactful areas. Our results can also provide a roadmap for future research and policy making. The method can be extended to study specific MHSs, compare its status, and comprehend the paradigm shift across different countries. While the conclusions are broad, they are comprehensive. They can be refined, and their details specified through future research based on refining the elements of the ontological framework.

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Appendix I: Glossary

Systemic Function: Systemic functions of mental healthcare systems
Governance: Governance of/for mental healthcare systems
Advocacy: Advocacy for mental healthcare systems in terms of use of information to deliberate/persuade various strategic ways to influence different stakeholders -consumers, family, NGOs, health and mental health workers, policy makers, planners, donors, general population and so on.
Service: Service of mental healthcare systems in terms of hospital services, community services, informal services, self-care services to meet the mental health needs of the people.
Information System: A mental health information system is a system for collecting, processing, analysing, disseminating, and using information about a mental health service and the mental health needs of the population it serves.
Research & Evaluation: Research and evaluation for mental healthcare system e.g., research driven strategies for mental healthcare and delivery
Human Resource: Human resources for mental health systems
Financing: Financing for mental healthcare systems e.g., allocation of funds
Level: The level at which mental healthcare and delivery are provided
National: National level mental healthcare system
State: State level mental healthcare system
District: District level mental healthcare system
City: City level mental healthcare system
Local: Local level mental healthcare system e.g., ward level, block level
Core Function: Core functions of the mental healthcare systems
Sensitization: Sensitization as a function of mental healthcare
Diagnosis: Diagnosis as a function of mental healthcare (identification and assessment)
Promotion: Promotion as a function of mental healthcare
Prevention: Prevention as a function of mental healthcare
Treatment: Treatment as a function of mental healthcare
Referral: Referral as a function of mental healthcare
Rehabilitation: Rehabilitation as a function of mental healthcare
Administration: Administration as a function of mental healthcare
Implementation: Implementation as a function of mental healthcare e.g., implementation of program/ intervention
Infrastructure: Infrastructure for mental healthcare
Drug Procurement and Distribution: Drug procurement and distribution for mental healthcare
Personnel Training: Personnel training for mental healthcare e.g.: upskilling, training, and orientation programs for personnel
Digital Mental Healthcare: Digital platform for mental healthcare
Provider: Provider of mental healthcare and delivery
General Hospital: General hospitals for primary care in mental health system
Psychiatric Hospital: Psychiatric hospitals for mental healthcare
Long Stay Facility: Long stay facilities for mental healthcare
Specialist Service: Specialist services for mental healthcare (to ensure accessibility, comprehensiveness, continuity and coordination of care, and needs led care e.g., forensic psychiatry
Community MHS: Community mechanisms for mental healthcare and delivery which includes day centres, rehabilitation services, hospital diversion programmes, mobile crisis teams, therapeutic and residential supervised services, home help, group homes and other support services
Day Centres: Day centres as part of community mental health services
Hospital Div. Prog.: Hospital diversion program as part of community mental healthcare and delivery
Mobile Crisis Team: Mobile crisis team as part of community mental healthcare and delivery
Therapeutic & Residential Supervised Service: Therapeutic and residential supervised services as part of community mental healthcare and delivery
NGO: NGOs as part of community mental healthcare and delivery
Self-Care: Self-care mechanisms for meeting the full spectrum of mental health needs of the population
Recipient: Recipients of the mental healthcare and delivery
Individual: Individual as a recipient of mental healthcare and delivery
Family: Family as a recipient of mental healthcare and delivery
Group: Group as a recipient of mental healthcare and delivery
Community: Community as a recipient of the mental healthcare and delivery
Others: Others as recipients of the mental healthcare and delivery
Outcome: The outcomes of mental healthcare systems
Accessibility: Accessible, affordable, and acceptable mental healthcare e.g., locally available outpatient and inpatient care
Effectiveness: Effectiveness as an outcome of mental healthcare and service
Equity: Equity as an outcome of mental healthcare and service available for all segments of the population
Efficiency: Efficiency as an outcome of mental healthcare and service
Accountability: Accountability as an outcome of mental healthcare and service e.g., quality mental health service
Human Rights: International human rights norms and standards should be respected when providing services for people with mental disorders

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