Mapping of Health Technology Assessment (HTA) teaching and training initiatives: Landscape for evidence-based policy decisions in India

Rinshu Dwivedi¹, Ramesh Athe², Sanghamitra Pati³, Krushna C. Sahoo⁴, Debdutta Bhattacharya⁵

¹Department of Science and Humanities, Indian Institute of Information Technology, Tiruchirappalli, Tamil Nadu, ²Department of Humanities and Science, Indian Institute of Information Technology, Dharwad, Karnataka, ³Director and Scientist-G, ICMR-Regional Medical Research Centre, Chandrasekharpur-Bhubaneswar, Orissa, ⁴Consultant (Public Health), Health Technology Assessment in India, ICMR-Regional Medical Research Centre, Chandrasekharpur-Bhubaneswar, Odisha, ⁵Scientist-D, ICMR-Regional Medical Research Centre, Chandrasekharpur-Bhubaneswar, Orissa, India

Abstract

Demographic transitions accompanied with epidemiological shifts are affecting many countries around the globe. These apprehensions have raised the concern for constructing and sustaining healthcare systems especially among resource-constrained low- and middle-income-countries (LMICs) such as India. Introducing Health-Technology-Assessment (HTA) in the educational initiatives could support planners and policy-makers in formulating evidence-based-decision-making along with tackling inequalities/inefficiencies and promoting cost-effectiveness in resource allocation. A mapping exercise has been undertaken for examining the feasibility and implementation of HTA curriculum in the existing courses in India. To gain best possible insight on HTA curriculum, a situational analysis was conducted using systematic search strategy through search engines such as Google, Google Scholar, ProQuest and PubMed. Currently, seventy-one institutes in India are offering one or more courses through regular mode at undergraduate/postgraduate/diploma-certificate/doctorate-level pertaining to Medical-technology (MT), Biostatistics (BS), and Health-economics (HE). MT was offered in 37 institutes (52.12%), followed by BS in 23 (32.39%), and HE in nine (12.67%). Only two institutes (2.81%) are offering certificate-courses on HTA, mainly confined in virtual modules. This review reveals noticeable gaps in the existing curriculum in India and necessitates a novel academic initiative by introducing HTA in a full-fledged manner. Reforms in the research and educational initiatives need to be brought for promoting awareness regarding HTA. The application of domain needs to be widened from the field of health-policy formulators to research and teaching. This should be further strengthened with the strong academic collaborations to generate replicable findings, address challenges, and offer solutions for existing threats to HTA.

Keywords: Health technology assessment, India, mapping, public-health, teaching

Introduction

Healthcare systems in developing countries are confronted with various challenges for improving the quality of healthcare along with minimum economic-burden on the households. There is evidence of increased demand for healthcare services,
predominantly attributed to demographic and epidemiological transitions.[1-3] Increased share of reliant population, higher burden of NCDs coupled with other emerging diseases and higher costs are affecting many countries around the globe.[4] These apprehensions have raised the concern for constructing and sustaining healthcare systems especially among the resource constrained low- and middle-income countries (LMICs) such as India.

Substantial progress has been attained toward achieving Universal Health Coverage (UHC) along-with Sustainable Development Goals (SDGs).[4] The country has witnessed sound economic growth and improvement in the major health indicators. However, public spending on healthcare remained abysmally low, resulting in high out-of-pocket expenditure (OOP) and considerable health-disparities across the country.[5,6] The mounting cost of healthcare services in India has surpassed the allocated budget for healthcare, which was one of the lowest in the world, i.e., about 1.3% of Gross Domestic Product (GDP).[7] Recently, the Government of India (GoI) has unveiled various social-security programmes with the purpose of attaining UHC by targeting SDGs.[8] Investing on cost-effective health technologies in India would be critical in the process of decision-making and providing equitable health to its population.[9-11]

Literature highlights on synthesizing the existing evidence for supporting healthcare decisions among clinicians, decision makers, and community.[11-19] An initiative in health care decision-making such as evidence-based medicine (EBM) and comparative effectiveness research (CER) have emerged as a response from clinical/evidences.[20-22] However, the decision-making process in healthcare is a complex and dynamic process which involves the interplay of various factors. These complexities have paved the way for the introduction of health technology assessment (HTA) as a combination of multidisciplinary fields.[23] HTA provides a globally accepted and structured approach on socioeconomic factors, medical devices and technologies, programmes and policies, and various ethical challenges involved in the adaptation/introduction of health technology in a more systematic, apparent, equitable, and vigorous manner.[11,12,22,28] It could be used to build a bridge between academic research and real-world decision-making. Currently, few countries have already initiated the inclusion of HTA in their academic curriculum as a module which is offered on both real and virtual platforms. Few of the academic institutions have also established HTA as a specialization in their academics/research domains.[25-29]

Major initiators of HTA modules were developed countries who initiated the inclusion of HTA in their academic curriculum as a combination of multidisciplinary fields.[23] However, the decision-making process in healthcare is a complex and dynamic process which involves the interplay of various factors. These complexities have paved the way for the introduction of health technology assessment (HTA) as a combination of multidisciplinary fields.[23] Introducing HTA in curriculum will guide the researchers to focus on the information which is crucial in nature and prioritizing the health goals for strengthening the database and health system as a whole.[20]

The Ministry of Health and Family Welfare (MoHFW) has introduced a new initiative, i.e., health technology assessment in India (HTAIn) to strengthen evidence-based service delivery through the Department of Health Research (DHR). They have designated few of the medical/public health research institutes in India as regional resource-hubs for HTAIn to cater the regional priorities along with evidence-based health policy decision-making/implementation.[30,31] Literature indicates that studies conducted under the HTA will be helpful in providing better primary care from the grassroots level. The results obtained from the HTA will be also relevant for the practice of primary care physicians as they can take evidence-based-decisions. This will not only help the physicians but also the general population and the Government at the broader level to maximise the outreach of various programs and minimise the cost associated with the health programs and policies. HTA can offer robust evidence-based approaches to make clear, informed policy-making and recommendations regarding the application of health technologies for the patients, which can significantly improve the overall performance of the healthcare system.[32-34]

Despite these prospective advantages, initiatives, and policy goals, HTA has not rooted firmly in the educational institutes to promote research by scientific methods. In India, HTA is not yet introduced as a complete curriculum which could be imparted through regular mode for strengthening the public health practitioners/policymakers for healthcare decision-making. In this study, we have highlighted how introducing HTA as a full-fledged module in the educational institutes can assist the government as well as the policy makers in effective priority setting for health sector reform and achieving UHC.

Methods

Search was conducted systematically through search engines such as Google, Google Scholar, ProQuest, and PubMed databases up to February 18, 2019. A set of keywords “Health Technology” or “Health Technology Assessment” or “Health Technology Assessment in India” paired with “teaching” or “training” and “teaching and training” consisting of single/combined terms has been used for the purpose of search. Also, secondary references from the literature have been reviewed along with the reference list of publications.[35-39] These included medical, medical technology (MT), HTA, educational courses; clinical and hospital administration/management; healthcare teaching; biostatistics (BS); health-economics (HE); and public health. The websites of the Indian Council of Medical Research (ICMR), the All India Institute of Medical Sciences (AIIMS), the Medical Council of India (MCI), the Indian Nursing Council (INC), the Universities Grants Commission (UGC), the Association of Indian Universities (AIU), along with the Ministry of Health and Family Welfare (MoHFW) were also searched to explore the courses offered on HTA. Searches were also made on the websites...
of the Indira Gandhi National Open University (IGNOU), other medical/health/educational institutes, and the World Health Organization (WHO).

Our searches were confined to the courses offered solely in India or in collaborations with other foreign institutes/universities, if any. Further, no restrictions have been applied in terms of duration, type of the degree, and certification awarded on the successful completion of these courses. Comprehensive information on the courses have been obtained through the concerned institutes or from their designated websites. In case of lack/unavailability of information on the mentioned websites of the concerned institutes, personal/telephonic contacts have been established with the universities/institutions for the detailed information.

After completing the thorough searches, we have excluded seminars/workshops and short-term courses/training programmes having duration less than 4–6 weeks. Additionally, we have also conducted a systematic review of the curriculum of these academic programmes to understand the content/context of HTA teaching/training at the undergraduate, diploma, postgraduate, and doctoral levels. The syllabi of community medicine in undergraduate courses, dentistry, nursing, and allied health sciences were also examined to landscape the contents linked to HTA. Similarly, masters/diploma courses in public health, and hospital administration/management were also surveyed to locate the inclusion of HTA as a component in these courses.

However, present study does not investigate the courses on HTA which have been offered as a part of clinical research, business management, and study programmes in other life sciences. The courses/modules were categorized for information in followings: (i) whether HTA is a part of the teaching curriculum; (ii) what is the mode of delivery; (iii) what are the broader contents (iv) which instructional methods have been engaged for teaching; and (v) what are the eligibility criteria for the selection. The relevant characteristics such as duration of courses, institutions, modes of teaching, targeted groups, and focused themes of courses were tabulated.

Results

Present study systematically explores the existence of HTA as a component, which is offered in various academic programmes/courses related to MT/BS/HE/HTA in India. MT/BS/HE as a subject is offered at various academic levels ranging from certificate courses, undergraduate, postgraduate, postgraduate diploma, and at the doctorate level. Major subdomains and specializations under the broad umbrella of medical science are Mathematical and BS, HE, MT, Health science and quality-control, and Health education. There are currently 69 institutes, centers, and universities in India that are offering one or more of these courses, mostly as a regular module [Table 1 and 2].

The most common subfields are (1) MT offered by 52.12% (n 37) of the medical and academic institutes, (2) BS, (n 23) offered by 32.39% of universities, colleges of science and medical institutes, (3) HE, offered by 12.67% (n 9) medical/research and technological institutes; and (4) HTA which is only offered by 2.81% (n 2) at the virtual platform by two medical institutes all over India. The courses were taught mostly in two modes, i.e., class room teaching and virtual platforms. Majority of these courses which varied significantly in time duration at each level were offered in class room teaching, i.e., 95.77% (n 68).

Generally, the undergraduate degree in India is obtained in three years, postgraduation in two years, certificate and diploma courses vary between six months to two years in traditional manner. The MPhil and PhD programmes range between 1–5 years and completion of these programmes significantly depends upon numerous factors.

The eligibility criterion for these courses also varies as per the universities, institutes, and organizations which are offering them. Generally, the candidates opting for undergraduate courses were selected with a minimum qualification of 10+2 with science as a major subject. For postgraduate courses in MT/BS/HE, candidates with MBBS/Statistics/Economics and others were eligible to apply as per the eligibility criteria of the offering institutes. Further, for applying in certificate courses for the above-mentioned subjects, the candidate needs to have a minimum qualification of 10+2 degree in science [Table 1 and 2].

HTA has not emerged as an independent discipline in any of the universities or institutes across India [Figures 1 and 2]. HTA is mainly offered at the virtual platform as a minor component in two institutes, where duration of the teaching was confined within six months' period. This situation clearly indicates the gaps currently existing in the Indian educational system in terms of dedicated educational initiatives for HTA. Interestingly, HTA is offered virtually as a short-term training module by only two medical/research and educational institutes but there is no academic degree or subfield/specialization in the map of educational teaching and training. The instructions in HTA have been integrated into various other programmes and these programmes also differ with respect to their focus, approach, contents, and most importantly the duration. The eligibility criteria for the selection of students/trainees are not clearly indicated and mentioned.

Discussion

Public health research in India has augmented over the years, though the qualities of these studies are still debatable. Limited numbers of studies are available on economic efficacy, cost-effectiveness/benefits, system cost, public policy perspectives, and evidence data synthesis in India. Health being a state subject drives the decision/implementation of health policies at the state level. Central government being primarily centralized in structure involves multiple stakeholders, who can also support states as a facilitator in medical
Table 1: Academic programmes on medical technology & health technology assessment at graduate, masters and other levels in India

| Center | University | Location | Eligibility | Certification | Duration | Mode of Delivery |
|--------|------------|----------|-------------|--------------|----------|------------------|
| **Northern Regions** | | | | | | |
| Baba Farid College | Panjab | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Govt Medical College, Amritsar | Guru Nanak Dev | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Adesh Institute Of Medical Science & Research, Bathinda | Baba Farid University of Health Sciences | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Lovely School of Technology & Computer Applications | Lovely Professional | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Luxmi Bai Institute of Dental Sciences & Hospital | Baba Farid University of Health Sciences | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Postgraduate Institute of Medical Education & Research Chandigarh | Dr. Babasaheb Ambedkar Technological | 10+2 from a recognized University | BSc | 3 Years | Regular |
| St. Soldier Group of Institutions Jalandhar | Guru Nanak Dev | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Hindu Girls College | Maharshi Dayanand | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Dyal Singh College, Karnal | Kurukshetra | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Government College Baundkalan, Bhiwani | Maharshi Dayanand | 10+2 from a recognized University | BSc | 3 Years | Regular |
| MM Institute of Medical Sciences & Research | Maharshi Markandeshwar | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Mukand Lal National College | Kurukshetra | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Baddi University of Emerging Science & Technologies | Babasaheb Bhimrao Ambedkar Bhilai | 10+2 from a recognized University | BSc | 3 Years | Regular |
| All India Institute of Medical Sciences Delhi | AIIMS, Delhi | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Chanderprabhu Jain Institute of Management & Technology | Guru Jambeshwar | 10+2 from a recognized University | BSc | 3 Years | Regular |
| University College of Med. Sciences & G.T.B. Hospital | University of Delhi | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Jamia Hamdard University | Jamia Hamdard | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Combined Institute of Medical Science & Research | Hemwati Nandana Bahuguna Garhwal | 10+2 from a recognized University | BSc | 3 Years | Regular |
| ICFAI Institute of Science And Technology Dehradun | Institute of Chartered Financial Analysts of India (ICFAI) | 10+2 from a recognized University | BSc | 3 Years | Regular |
| The Himalayan Institute of Medical Sciences | Himachal Pradesh | 10+2 from a recognized University | BSc | 3 Years | Regular |
| **Western Regions** | | | | | | |
| Keshavji Bharmal Samaria Commerce & Nataraj Professional Sciences College | Veer Narmad South Gujarat | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Asian Institute of Health Sciences | Manipal | 10+2 from a recognized University | BSc | 3 Years | Regular |
| **Eastern Regions** | | | | | | |
| Satyendra Narayan Sinha Institute of Business Management | Ranchi | 10+2 from a recognized University | BSc | 3 Years | Regular |
| Halidai Institute of Allied Medical & Health Sciences | Vidyasagar | 10+2 from a recognized University | BSc | 3 Years | Regular |
| **Southern Regions** | | | | | | |
| Maharajah Institute of Medical Sciences | Dr. N.T.R. University of Health Sciences Andhra Pradesh | 10+2 from a recognized University | BSc | 3 Years | Regular |
| P E S Institute of Medical Sciences And Research | Dr. N.T.R. University of Health Sciences Andhra Pradesh | 10+2 from a recognized University | BSc | 3 Years | Regular |
| SVS medical college | Dr. N.T.R. University of Health Sciences Telangana | 10+2 from a recognized University | BSc | 3 Years | Regular |

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education/managing regulatory bodies and other activities. The potential use of HTA curriculum could be for evidence-based healthcare decision-making, policy formulators, innovators, and Government of India.184

Except government, other identified relevant/potential stakeholders in the HTA can be medical institutes, research and development (R & D) organizations, pharmaceutical industry, insurance companies, and healthcare providers. India has recently embarked on the journey of introducing HTA for evidence-based informed policy making.86,87 Having widespread regional variations in health parameters across the country, it is going to be a herculean task to implement the results from HTA as a nationally representative figure.

Findings from the present study reveals that in spite of having various healthcare challenges which meticulously require HTA involvements, especially in providing better primary care, India lacks rigorously in formal educational and training initiatives on HTA.104 Introducing HTA among the major educational institutions can specifically address the regional as well as state specific healthcare challenges by strengthening the education and training courses.17,30,41 Results indicate that an infinitesimal segment (2.81%; n 2) of the institutions are offering HTA with the constraint of virtual training. It will strengthen the capacity building for the targeted trained manpower in tackling these health care concerns, increasing the transparency, inclusiveness, and accountability of the process across various states and regions in India. The cornerstone of these modules would contribute in the advancement of virtuous training along with addressing the essential needs of the workforce with required skills.142-47 It will also reduce the excessive reliance on external experts and resource-persons by enabling the potential researchers involved in the learning pedagogy of HTA.

The infusion of various domains in HTA not only offers it an added advantage but also ascribes it a distinct/unique identity to provide appropriate solution to the public-health problem. Establishing HTA as a full-fledged educational module among academic, teaching and training, and research institutes in India would create and reinforce the healthcare system. Further, it will also enable the workforce to contribute in an evidence-based-monitoring and instrumentation of various public-health programmes, policies, and decision-making processes.13,48-52

In India, about 2 to 3% share from the GDP was apportioned for the education sector, which needs to be increased for development and promotion of educational endeavors in HTA curriculum.169 Further, keeping in view the major healthcare concerns among the LMICs, there is a need for the promotion of HTA as a regular discipline by highlighting its progressive effects on public health practices and quality of care among the community.15,56 The implementation of HTA curriculum prerequisites resources such as sustained institutional and university commitment along with manpower and financial commitments.

Evidence from various countries with existing HTA modules also emphasizes on curriculum based common standards for educational initiatives and quality and training assurance implementation of community-based strategies for efficient,
Table 2: Academic programmes on Biostatistics and Health economics at graduate, postgraduate, PhD, and other levels in India

| Biostatistics (Graduate level) | Certifications | Duration | Mode of delivery |
|--------------------------------|----------------|----------|------------------|
| Malwa Degree College           | BSc            | 3 Years  | Regular          |
| KV Pendhakar College of Arts, Science, and Commerce | BSc            | 3 Years  | Regular          |
| Government Degree college      | BSc            | 3 Years  | Regular          |
| St. Marys College              | BSc            | 3 Years  | Regular          |
| Gems Arts and Science College  | BSc            | 3 Years  | Regular          |

(Masters, diploma and other levels)

| Center                                      | University         | Location    | Eligibility                           | Certification | Duration | Mode of delivery |
|---------------------------------------------|--------------------|-------------|---------------------------------------|---------------|----------|------------------|
| Lucknow University                          | Lucknow University | Uttar Pradesh | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| Lucknow University                          | Lucknow University | Uttar Pradesh | Any graduates with Mathematics as one subject | MA            | 2 Years  | Regular          |
| Kavitth Memorial Degree and PG College      | Kavitth Memorial Degree and PG College | Telangana | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| Christian Medical College                   | Christian Medical College | Tamil Nadu | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| National Institute of Epidemiology          | National Institute of Epidemiology | Madras | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| The Tamil Nadu Dr MGR University            | The Tamil Nadu Dr MGR University | Madras | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| SDNBV College of Women                      | SDNBV College of Women | Madras | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| Madurai Kamraj University                   | Madurai Kamraj University | Tamil Nadu | Any graduates with Mathematics as one subject | PG Diploma    | 1 Years  | Regular          |
| Manipal Academy of Higher Education         | Manipal Academy of Higher Education | Karnataka | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| National Institute of Mental Health and Neuroscience | National Institute of Mental Health and Neuroscience | Karnataka | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| NITTE                                       | NITTE              | Karnataka   | Any graduates                        | Certificate course | 6 Months  | Regular          |
| Kerala Veterinary and Animal Science University | Kerala Veterinary and Animal Science University | Kerala | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| Mahatma Gandhi University                   | Mahatma Gandhi University | Kerala | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |
| St. Thomas College                          | St. Thomas College | Kerala      | Any graduates with Mathematics as one subject | MSc           | 2 Years  | Regular          |

(Doctorate level)

| Center                                      | University | Location    | Eligibility                           | Certification | Duration | MoD |
|---------------------------------------------|------------|-------------|---------------------------------------|---------------|----------|-----|
| Indian Veterinary Research Institute        | IVRI       | Uttar Pradesh | Post graduates in Statistics/Mathematics | PhD           | 5 Years  | Regular |
| Rama University                             | Rama       | Uttar Pradesh | Post graduates in Statistics/Mathematics | PhD           | 5 Years  | Regular |
| Rajendra Memorial Research Institute of Medical Sciences | RMRIMS | Bihar | Post graduates in Statistics/Mathematics | PhD           | 5 Years  | Regular |
| National Institute of Mental Health and Neuro Science | NIMHANS | Karnataka | Post graduates in Statistics/Mathematics | PhD           | 5 Years  | Regular |

Health Economics (Masters, diploma and other certificate level)

| Center                                      | University         | Location    | Eligibility                           | Certification | Duration | MoD |
|---------------------------------------------|--------------------|-------------|---------------------------------------|---------------|----------|-----|
| Post Graduate Institute of Medical Education & Research | PGIMER | Punjab      | Master's degree in any discipline    | Certification | 3 Months | Online |
| Indian Institute of Public Health           | IIPH, Delhi        | New Delhi   | Bachelor's degree/Master's degree in any discipline | MPH           | 1 Years  | Regular |
| Indian Institute of Technology              | IIT Kanpur         | Uttar Pradesh | Bachelor's degree/Master's degree in any discipline | Certification | 2 Months | Regular |
| Indian Institute Of Health Management Research | IIMHR | Rajasthan     | Bachelor's degree/Master's degree in any discipline | Certification | 2 Months | Regular |
| Indian Institute of Public Health           | IIPH, Gujarat      | Gujarat     | Bachelor's degree/Master's degree in any discipline | MPH           | 2 Years  | Regular |
Initiation of HTA curriculum requires the involvement of numerous stakeholders, extensive capability building of the existing and potential workforce, and improved infrastructure. Introducing full-fledged courses would be the best for implementing HTA in India. It could be initially incorporated in the integrated curriculum for master's level public health programmes offered by ICMR and other medical/academic institutions. Further, virtual and distance learning initiatives could be also undertaken for skill-based HTA education, as these programmes would be more flexible, intensive, and responsive to changing demands of its learners.

The probable employment opportunities could be explored locally, nationally, and internationally in various organizations in the area of healthcare. Also, nongovernmental organizations (NGOs), medical colleges and hospitals, pharmaceutical industry, state and centrally run policies and schemes may also successfully engage the trained manpower.

As per the evidence from the available literature, teaching and training programmes architect the future research and policy formulation. HTA implications would be better understood by the people at the decision making level in a series of health policies.

Accordingly, comprehensive efforts are required at each stage for teaching and training of HTA at the wider-scale to cater the suitable healthcare needs/demands. Resultant improvement in decision making and health care technologies would pave a way to achieve enhanced awareness, improved access, and desired affordability along with the better human and institutional capabilities to endure progressive health technology advances.

The future prospects of HTA curriculum in India

Being burdened with increasing cost of health-care services, higher share of OOPE and impoverishment, the HTA curriculum holds a promising future in Indian health-care system. It could provide a platform for the prospective policy formulators to be engaged in strategic decision making by maintaining equilibrium between demand and supply of healthcare services, evidence-based prioritization of assessment and implementation of innovative schemes.

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### Table 2: Contd...

| Center                                | University                     | Location     | Eligibility                  | Certification | Duration | Mode of delivery |
|---------------------------------------|--------------------------------|--------------|-----------------------------|---------------|-----------|------------------|
| Indian Institute of Public Health     | IIPH, Gujarat                  | Gujarat      | Bachelor's degree/Master's  | MHM           | 2 Years   | Regular          |
| Indian Institute of Public Health     | IIPH, Hyderabad                | Telangana    | Bachelor's degree/Master's  | MPH           | 2 Years   | Regular          |
| Christian Medical College             | Dr MGR Medical                 | Tamil Nadu   | Bachelor's degree/Master's  | PG Diploma    | 1 Year    | Regular          |
| Manipal Academy of Higher Education   | MAHE                           | Karnataka    | Bachelor's degree/Master's  | MSc           | 2 Years   | Regular          |

### Certificate course on HTA

| School of Public Health               | PGIMER                        | Punjab       | Any graduation              | Certificate   | 6 Months | Online           |
| Amrita Institute of Medical Science (Joint With Ruskin University, UK) | Amrita Vidyapeetham | Kerala       | Any graduation              | Certificate   | 3 Months | Offline          |

Source: Searched and compiled by the author

Figure 1: Layout of the curriculum of B.Sc. Medical Technology in India
Source: Created by the authors

Figure 2: Layout of the curriculum of Medical Technology and HTA in India (M.Sc. and certificate courses on HTA)
Source: Created by the authors

productive, and skilled manpower. Initiation of HTA curriculum requires the involvement of numerous stakeholders, extensive capability building of the existing and potential workforce, and improved infrastructure.
This curriculum may guide in initiating a bridge between the prospective health care providers and appropriate population in need of certain interventions. Being a key initiator of HTA, the government can minimise wastage of the financial resources and opportunity cost, and would be also benefited in terms of better affordability, improved provisioning of health service, and avoiding inappropriate practices.

Smooth functioning of the proposed curriculum and translating cost-effective service provision into practice may be confronted with complex and fragmented educational/academic design in India.\cite{35,36} Other major challenges associated with the effective implementation of the curriculum in India are inclination of the educational system, availability of essential data/evidence, cost for implementation, infrastructure/manpower, and monitoring/evaluation. Further, health being a state subject drives the decision-making and also creates intricacies between the central and state government which may affect the implementation of HTA. Present study stresses on the expected outcomes from the proposed curriculum which may increase the credibility, accountability, quality of the trained manpower, utilization, and quality of care especially for the disadvantaged segment of the population.

Conclusion

As per the initiatives of DHR, the HTA research activities are carried out in India through HTAIn hubs which have been initially setup in six regions of the country. This review highlights noticeable gaps in existing curriculum in India and necessitates a novel academic initiative by introducing HTA in a full-fledged manner. There is dearth of any formal educational endeavors, teaching, and training courses offered in regular manner in any of the educational institutions in India. Due to lack of integrated course/module availability, an urgent need is felt to formalize a standardized course that can cover all domains of HTA and is deliverable to the proposed audience in most convenient manner. To strengthen the future HTA activities, lessons can be drawn from success stories of Asia-Pacific regions such as Australia, Singapore, Malaysia, New Zealand, and others. This should be further strengthened with strong academic collaborations to generate findings, challenges, and solutions. It would also strengthen the available manpower, ensure a healthy community, environment, and sustainable and affordable health technologies to achieve UHC. We propose to introduce teaching/training modules on HTA in full-fledged classroom-based learning along with distance and virtual methods. Being in the initial stage, we recommend introducing this curriculum in the government/public organisations, including research, academic, and autonomous public institutions. At the later stages, the other stakeholders such as private sector, NGOs, and civil society organizations can be also involved.

Limitations of the study

Being an evidence-based review; it is confined to the survey participants, so the generalizability may vary from curriculum to curriculum. Being a noble initiative, evidence are limited for educational initiatives on HTA in Indian context.

Author’s contribution

RD, RA, and SP designed the study. RD with the help of RA wrote the paper. RA with the help of RD analyzed the data. RD, RA, SP, KCS, and DB finalized the article. All authors read and approved the final manuscript.

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Conflicts of interest

There are no conflicts of interest.

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