RESEARCH ARTICLE

PRECISION PUBLIC HEALTH AN INDIAN PERSPECTIVE – RAPID REVIEW

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ABSTRACT

Dental public health has long focused on traditional oral health promotion and disease prevention strategies as the basis of community oral health programs. 'Precision' public health (PPH) is conceptualised as a means of improving population health through the use of new technologies, particularly genomics and digital, which would guide public health practice by generating more individually tailored interventions and policies. The purpose of this article is therefore to highlight some of the evidentiary and philosophical challenges for the concept of 'precision public health' which have not been exposed to sufficient scrutiny. It is also to argue for a more considered focus beyond the genome, lest we career headlong towards a diversion of resources, away from what really matters, to the detriment of population health. Despite, opportunities for precision public health, many challenges lie ahead. The added value of new tools and approaches to public health practice needs to be evaluated just like precision tools should be evaluated in medicine. A sustainable informatics capacity is also needed to enhance connectivity and interoperability of clinical, laboratory, and public health systems. The rapid review also denotes a few ways to improve and implement Precision Public Health in Indian Scenario, for providing a productive, promoting health care system in mere future.

INTRODUCTION

Dental public health has long focused on traditional oral health promotion and disease prevention strategies as the basis of community oral health programs. While these initiatives are important, grounded in evidence, and a part of our legacy, the specialty and practice of dental public health will evolve in response to emerging technology. The concept of precision public health will have a profound impact on the future of health care and how dental public health will be practiced[1]. Precision Public Health is a new and rapidly evolving field, that examines the application of new technologies to public health policy and practice. It draws on a broad range of disciplines including genomics, spatial data, data linkage, epidemiology, health informatics, big data, predictive analytics and communications. The hope is that these new technologies will strengthen preventive health, improve access to health care, and reach disadvantaged populations in all areas of the world. Precision medicine is a medical model that proposes the customization of healthcare, with medical decisions, treatments, practices, or products being tailored to a subgroup of patients, instead of a one-drug-fits-all model. Initially, the primary focus of precision medicine was treatment at the individual level.

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However, novel research advances are exploring a population focus to better determine risk for future disease and disease mechanisms[1]. This new area of discovery expands the opportunity to explore the role of genomics in population health. Shifting the focus from treatment to prevention and from the individual to the population may provide greater opportunities for the expansion of disease prevention strategies. There is a growing interest to look at prevention at a population level to better explain causal relationships and disease prevention strategies. Recently the Centre for Disease Control suggested that 'precision public health' presents significant opportunities to improve the health of the population. The promise is that by harnessing the power of Big Data, particularly genomic data, we may indeed see early gains in public health as a result of 'more-accurate methods for measuring disease, pathogens, exposures, behaviors, and susceptibility' to guide targeted prevention strategies (Taylor-Robinson, 2019). The Precision Medicine Initiative promises a new healthcare era. Improvements in quality of sequencing, reduction in price, and advances in "omic" fields and biotechnology promise a new era, variably labeled personalized or precision medicine. Although genomics is one driver of precision health care, other factors may be as important (e.g., health information technology) (Taylor-Robinson, 2019). A prime concern for public health is promoting health, preventing disease, and reducing health disparities by focusing on modifiable morbidity and mortality.

Table 1. Different Approaches in Implementing Precision Public Health

| SNO	PRECISION PUBLIC HEALTH APPROACHES	INFERENCE
1	PREDICTIVE	The central idea here is that access to personalized genetic data might improve identification of higher-risk individuals and subsequently guide their lifestyle choices. Although there are undoubted public health benefits to harnessing population-level 'big data' to inform policy and evaluation
2	PREVENTIVE	Setting aside for a moment the challenges to developing better prediction engines, their use is premised on offering 'personalized' risk information to guide lifestyle choices and tailored prevention strategies
3	PERSONALIZED	Others go further and believe that behaviour change is characterized by highly non-linear Phenomena, sensitive to initial conditions, and is best understood through the lens of complexity theory, but a problem for individual-level personalization is the fact that giving people ever more refined risk information seems to have little impact on behaviour and of course could cause harm.
4	PARTICIPATORY	The final P (Participatory) from the P4 personalized medicine mantra connotes the desire to fully involve the patient (or in our case, a healthy person) in making lifestyle choices. Now although a much greater research effort has so far gone into uncovering the physiological ways to personalized prevention (with genotypes and biomarkers), an equally valid approach to personalization is to better understand patient preferences.
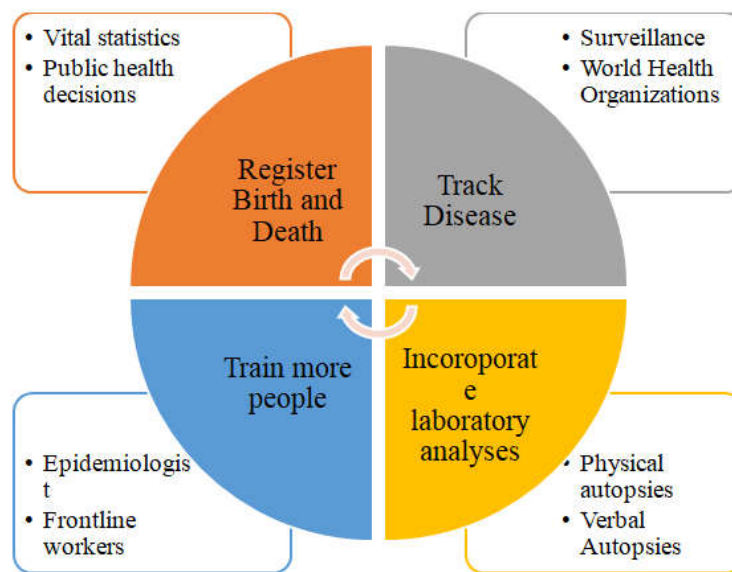
Figure 1. Steps in Achieving Precision in Health care

In 2014, CDC estimated the annual number of potentially preventable deaths from the top five causes in the U.S. The purpose of this article is therefore to highlight some of the evidentiary and philosophical challenges for the concept of 'precision public health' which have not been exposed to sufficient scrutiny. It is also to argue for a more considered focus beyond the genome, lest we career headlong towards a diversion of resources, away from what really matters, to the detriment of population health. The review also tries to denote few ideas through which Precision Public health can be a part in developing countries like India to impart and develop the health care system to the community in a customized way.

PRECISION PUBLIC HEALTH APPROACHES: The PPH is considered to be an effective way of improvising the health care system in a system-based community care globally. There are various approaches through which the new venture can be implemented in different Global scenario. The table 1 denotes the various approaches for PPH to be implemented in Indian Health care system.

STEPS IN PPH: The use of data to guide interventions that benefit populations more efficiently is a strategy we call it as precision public health. It requires robust primary surveillance data, rapid application of sophisticated analytics to track the geographical distribution of disease, and the capacity to act on such information. The availability and use of precise data is becoming the norm in wealthy countries. But large swathes of the developing world are not reaping its advantages. The Bill & Melinda Gates Foundation in Seattle, Washington, are committed to seeing data used equally in the developing world. The United Nations' Sustainable Development Goals, launched in September 2015, will require ever more accurate and timely data to track and achieve progress (Dowell, 2016). The following were followed are the key steps in achieving Precision Public Health

Data trending: The public-health community is sharing more data faster; expectations are higher than ever that data will be available from clinical trials and from disease surveillance. "Data quality is often too poor to drive decisions."

Speed Accuracy and Equity: If health workers know how to target treatment to the fraction of patients who need it. Thus, improved surveillance and analysis allows an impoverished population to receive an intervention that is standard practice in wealthy countries, but which is not used in much of the developing world. Geographic precision also means that public-health resources are used more efficiently, so more people receive interventions

Achieving Precision: Four concrete steps are necessary for precision public health to become regularly available in the developing world (Dowell, 2016).

CHALLENGES IN PPH: The common challenges that can be faced by applying the PPH in an Indian scenario can be like

- The inherent limits to risk prediction at the individual level, when the uncertainty due to random processes may be conflated with the uncertainty due to limited data or knowledge;
- The limitations on prevention interventions that rely on individual agency, where such a focus might widen inequalities (Kee, 2020)
- The less emphasis on the supposed new insights gained from an individual's genetics and their 'big data' instead of their own preferences for a particular intervention strategy (Collins, 2015)
- The diversion of limited resources and attention away from the social determinants of health.Building on these issues, recent exchanges have called for a refocusing of the criticisms of PPH as scientific challenges (Kee, 2020).

PPH IN ORAL HEALTH: As we all know, conventionally there are two major public health approaches– the "high risk" approach and the "population" based approach. While both have their strength and weakness, a new dimension should emerge in recent times to "targeted vulnerable population" approach, which seeks to reduce health inequities, by also improving public health by specifically identifying those at higher risk of oral health conditions and addressing their oral health needs at the earliest. We are at an age of genomics, epigenomics, exposomics and the big data revolution, where precision medicine is fast emerging as the way to treat disease, though it has its own distinct advantages and disadvantages, especially because the research data bases for such approaches on oral database in Indian Context is not fully representative of the global population and developing countries are far from catching up with it at present and need to focus on data drenching methods (Chaudhury, 2022).

RECOMMENDATIONS

Precision public health is about providing the right intervention to the right population at the right time, by using highly accurate methods for measuring disease, pathogens, exposures, behaviours as well as susceptibility that could allow better assessment of population health, development of health policies and better targeted programmes for preventing disease globally. Hence in mere future public health professionals should significantly improve their work efficiency by building competencies that precision public health will demand in future as a point to impart in public health agencies and organizations (Rubin, 2015).

CONCLUSION

Before rushing headlong into implementation and workforce training for PPH there are lot of insights and challenges. Until these issues are addressed, it will not be clear that the benefits of superficial intervention 'tailoring' for personalised prevention, common in today's PPH interventions delivered through mobile technologies, outweigh the harms. A peep into the world of game theory will help us understand why collaborative strategy has higher probability of winning a progressively higher competitive game of health care. Thus health services, oral health and public health organizations must work collaboratively to each other's mutual leverage in the increasingly tough war of public health challenges in a globalized world.

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