

# Dispelling Myths and Misinformation Using Social Media: A Three-Countries Comparison Using the Case of Tuberculosis

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**Abstract**— Myths and misinformation about diseases or illnesses can contribute to the stigmatization of patients suffering from them. In many cases, these people end up being ostracized from society and have lower positive health outcomes. Education has been known to be a good intervention to dispel such myths. With the increasing number of social media users, it is pertinent to explore the appropriateness of social media for health education and whether there are age and country differences. In this study, a contagious disease - tuberculosis (TB) - was used as a case study to examine the level of belief in ten TB myths in three different countries (Vietnam, India and Singapore). A total of 3,000 respondents completed a verbally administered survey and it was found that the most pervasive myth was that excessive smoking caused TB. India significantly agreed with the most number of myths. In terms of social media, the highest number of users for Vietnam is in the 21-25 years old group, with Singapore's in the 41-50 years old group, and the 31-40 years old group for India. The paper discusses implications for health researchers and policymakers in the use of media to educate disease myths.

**Keywords**—social media; myths; misinformation; health; tuberculosis; comparative study

## I. INTRODUCTION

Health myths and misinformation have generally been passed down the generations across society and within families through stories that could have preyed on old beliefs and impressions via copious modes of communication like mass and new media or even oral transmission. Such erroneous health beliefs can be detrimental to people's own health when it increases the stigma attached to the disease or illness and prevents them from seeking or continuing treatment. Some misconceptions are generated by ignorance to the subject or it could be rooted in cultural or religious reasons [1].

Health misinformation has been perpetuated on mass media at times not on purpose, but the messages have been structured as partial truths to fit into a storyline [1]. Media audience theories and cultivation theory from

communication literature put forward that users and audience may or may not always purposely seek out health information on such media, but whatever has been sensed could be a drawing point for people to construct their ideas and beliefs about the world and themselves from [1, 2]. It has always been up to users to decide for themselves how and what to use the varied information they get. Knowing about truthful information may not necessarily translate into proper health behaviour [3]. We are being saturated with media messages now, not only from mass media but the Internet and social media as well.

There has been an increasing awareness of the potential of social media in helping to dispel health myths and misinformation. Many public health centers and programs are turning to social media to create awareness about healthcare systems and diseases, but it has been acknowledged that even though attention can be garnered, correct messages may not be getting out properly [3]. Still, public health organizations (e.g. Center of Disease Control, World Health Organization) have thousands of followers on social media such as Facebook, Twitter and YouTube, and so it is highly possible to communicate health messages to correct perpetuating myths on such platforms [4].

### A. Case of Tuberculosis (TB)

Tuberculosis (TB) has existed more than 15,000 years ago, caused 900 deaths per 100,000 in the 18<sup>th</sup> century in Western Europe where even royalty was not spared, and is still a leading infectious disease killer today [6]. It has been called a number of names like consumption, white plague and Pott's disease. The World Health Organization (WHO) [7] estimates that the causative agent of TB, *Mycobacterium tuberculosis*, exists within one-third of the world's population latently and out of which, 10% develop active TB [8]. This disease is still considered a global health priority by WHO and thus, it is of utmost importance for TB control from the social and technological aspects complimenting the current clinical methods.

A main cause of delayed diagnosis or treatment refusal lay on the beliefs of the very people the clinical system is seeking to treat. TB myths and misinformation that exists within societies could lead to health behaviours that are disadvantageous. It is most common in rural areas and people are not aware of how TB is transmitted. For example in Wote, Makeni, Eastern Kenya, most of the villagers believe that TB is caused by witchcraft or the cold, and so they do not open windows which results in the lack of light and ventilation which is dangerous because the TB bacteria thrive in such environments [9]. Misinformation about the mode of transmission for TB can also be the reason why stigma exists for the patients [10]. Most people are unaware that only pulmonary TB is contagious and transmitted through air. People are afraid of being infected and dying, which is why they shun TB sufferers although once someone diagnosed with TB goes on treatment for at least two weeks taking their medications correctly, they are no longer contagious. The fear and stigma of TB was identified as a factor that negatively impacts treatment compliance and delays in diagnosis, which could fuel infection rates in the community [11].

Most studies that have elicited out the kinds of myths or misinformation people have about TB are usually of qualitative origins, where interviewers probe with questions to patients or healthcare workers. A mixed-method cultural epidemiological study was done in 2004 to examine cultural and gender concepts of TB among the rural population in Maharashtra, India [10]. When asked about perceived causes of TB, some respondents listed sexual relations as sufficient to transmit TB. Some other respondents explained that a pregnant woman with a cough could pass the disease to the fetus. Males were more likely to link addictive behaviours, such as smoking, to TB. Women living in that area of India generally learn about TB from their personal experiences and interactions with affected members of their community as they are considered less mobile and illiterate, while men learn about TB mainly from health services (such as advertisements on TV and radio).

TB control programs today do consist of interventions to help address the knowledge and behaviour of patients and the general public. Interventions to educate the people about TB tend to lie in the domains of giving out information through different types of media. For example in India, the Information, Education, and Communication (IEC) strategy is part of the Revised National TB Control Program and done through campaigns [12]. An investigation done in Delhi about IEC efforts found that communication strategies need to be improved and targeted area-specific [13]. Certain areas require street plays or paintings, while hoardings or Hindi newspapers may work better in other places. Many were in favor of using the television as a means for IEC, and those in the slums or rural settlements preferred door-to-door campaigns. TB treatment myths like consuming tortoise meat to cure the disease was found to still be prevalent in India from focus group discussions with patients and the public community. It was suggested that appropriate messages should remove such myths and superstitions to change society's attitude towards TB.

## B. Country comparative study

This study chose three different countries with differing cultures and economies to explore the types of health misinformation that may be apparent in different ways.

TABLE I. COMPARISON OF VITAL INFORMATION BETWEEN VIETNAM, INDIA AND SINGAPORE

	Vietnam	India	Singapore
<b>Population 2011</b>	87.84 million	1.241 billion	5.184 million
<b>GDP 2011 (US\$)</b>	123.6 billion	1.848 trillion	239.7 billion
<b>Life expectancy (years)</b>	75	65	82
<b>Urban population</b>	31.04%	31.3%	100%
<b>Literacy rate</b>	93% (in 2010)	61% (in 2006)	96% (in 2010)
<b>Poverty headcount ratio at national poverty line</b>	14.2%	29.8%	NA
<b>TB profiles</b>			
<b>Mortality rate per 100,000 population 2011 (excludes HIV+TB)</b>	33 (14-62)	24 (15-35)	1.8 (1.6-2)
<b>Prevalence number in thousands 2011 (includes HIV+TB)</b>	290 (130-500)	3100 (2100-4300)	2.4 (0.95-4.4)
<b>Case detection, all forms</b>	56%	59%	86%
<b>Treatment success rate 2010 (for new smear-positive)</b>	92%	88%	80%
<b>TB cases with MDR-TB 2011</b>	2.7% among new 19% among retreatment	2.1% among new 14% among retreatment	0.64% among new 0% among retreatment
<b>Total budget for financing TB control in 2013 (US\$ millions)</b>	63	207	-

Vietnam is an East Asian developing country with a general lower middle income level. The next country chosen was India, a South Asian country with again a lower middle income level but with a huge population and ranks much lower on health indicators. Singapore, a sovereign city-state in the Asia-Pacific region with a developed economy that has a high income level on overall, was chosen as the last country for comparison. The selected population within all three countries was those generally considered as the middle-of-the-pyramid (MOP) and is typically thought to be the middle/working class. This section of the population is known to have a more advancing view of technology, thrives on entrepreneurship, and emphasizes on education and hard work. Recently, the middle class have been linked with the idea of 'new consumerism' which is the upscaling of lifestyle norms and this drives the trade economy [15]. The MOP is of interest as it constitutes a bulk of the world's population with enough means to strive for advancement in status and technology. In general, to get a better insight and for further comparison, see Table 1 that contains vital information between the three countries gathered from sources such as the World Bank database [16] and WHO [17].

C. Aim and Objectives

This study sought to fill in the gap as to how much do people believe in perpetuating TB myths in each individual country and to find out the use of social media in these urban cities of the three countries (Vietnam, India and Singapore). Ultimately, strategies to dispel these myths and TB misinformation using technology would be suggested.

II. METHODS

The survey was commissioned to two research consulting companies for data collection and took a month to complete from briefings to the final computerized dataset given.

A. Participants

There were a total of 3000 respondents, with 1000 respondents per country from Vietnam, India and Singapore. The respondents came from urban cities.

In Vietnam, 440 males (age: M=44.11, SD=15.87) and 560 females (age: M=43.65, SD=15.57) were interviewed. Six top urban cities (Ha Noi, Hai Phong, Da Nang, Khanh Hoa, Ho Chi Minh and Can Tho) within Vietnam were chosen for the most ideal representation with a minimum sample size of n=100 per city. Information about the districts and wards within these cities were obtained from the General Statistics Office of Vietnam and rural districts were removed. Within the chosen districts, the wards were determined by using systematic random sampling, where the first ward was chosen arbitrarily and each successive ward chosen at a fixed interval. This interval was determined by dividing the total number of valid wards by the required number of wards. Primary Sampling Units (PSU) which constitutes a cluster of approximately 500 living quarters and households were then generated from each selected ward. Within each PSU, a smaller sampling block of approximately 100 households were selected using a simple random process. The fieldwork methodology for the selection of households is as follows:

1. An immobile landmark that will not be destroyed for a foreseeable period was identified as a fixed starting point and the right-hand rule was applied in the selection of households. The interviewer would place their back to the main entrance of the house structure and move to the right direction.
2. All interviews were attempted at the person’s home either at the door or inside. The first interview would be attempted from the third household counting right from the starting point.
3. Selection of respondent was based on the Kish Grid method for equal-probability sampling for selecting cases at random when more than one case is found to be eligible for inclusion when the interviewer calls at a sampled address or household.
4. The interviewer would make a minimum of three attempts on separate occasions to secure an interview with an eligible household member to provide an opportunity for hard-to-reach individuals to be included in the sample.
5. No two successive attempts in a given household were made within 2 hours unless it was an appointment.
6. If after three visits there was no success, the interviewer would approach the next household directly on the right. If that is unsuccessful, the household on the left of the main initial household would be approached.
7. Once an interview is successful, the next third household in the right-hand direction would be approached.

In India, there were 458 males (age: M=39.81, SD=15.19) and 542 females (age: M=37.16, SD=12.44) were interviewed. Respondents were sourced across five cities in India (Delhi, Mumbai, Kolkata, Chennai and Hyderabad) with 200 respondents for each city, coming to a total of 1000 respondents for India. Twenty urban wards were chosen through systematic random sampling just like Vietnam however the PSU were each of the 20 selected wards. Slum settlements identified from middle-to-higher income settlements through thematic mapping were removed and the remaining middle-income settlements were further clustered into five areas: north, south, east, west and central. Two households were selected from each cluster, arriving at a total of 10 samples per ward and further, 200 samples per city. Selection of households and respondents followed the same seven steps of fieldwork methodology as in Vietnam.

For Singapore, 472 males (age: M=42.54, SD=16.39) and 528 females (age: M=44.43, SD=15.04) were interviewed. The survey comprised of 1,000 Singapore Citizen, Permanent Resident, Employment Pass holders (holder for at least 6 months) and S Pass holders (holder for at least 6 months) aged 18 and above. 18 geographical locations were randomly generated across the city-state which were later stratified further into zones as starting points allocated for each interviewer. A top-down approach was used for each selected residential block and interviewers navigated from the highest level to the lowest level in search of eligible respondents. For each level, the interviewers moved from the household with the smallest unit number to the largest unit number in ascending order till they complete the quotas. For each successful interview, the interviewers will then skip two households before continuing with the search.

TABLE II. TB MYTHS ITEMS USED IN MOP SURVEY

Items used (TB Myths)
a. You believe TB is a hereditary disease
b. You think excessive smoking causes TB
c. You believe once someone gets vaccinated as a baby for TB, he or she is protected for life against this disease
d. TB is a disease of the lower socioeconomic classes.
e. If someone coughs, you will automatically get TB
f. If you don't have the symptoms of TB, it means you don't have TB
g. A TB infection will always turn into a TB disease
h. TB is a thing of the past, and is no longer a public health concern
i. Only drug users and people with HIV/AIDS get TB
j. TB has no cure

B. Materials and Measures

The whole survey contained five sections (Demographics; Media sources; Community Engagement; General Health; and Specific Health) but for the purposes of

this study, only items from the demographics, media sources and specific health sections were used for analysis. Questions regarding age, gender and education were in the Demographics section.

The most common TB myths items were sourced from the factsheet of the Respiratory Health Association of Metropolitan Chicago [18] and previous studies about perceptions and attitudes towards TB [8]. Each item as mentioned in Table 2, required a response on a five-point Likert scale on how much the respondent agrees to the statement (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). The total score was added up and averaged. The higher the score, the more the belief in such myths exist.

To determine social media use, questions regarding the types of social media applications used, importance of reasons for social media use and actual intentions of social media use were asked (see Table 3).

For Singapore, the survey was administered in three languages (English, Chinese and Malay). The translation into Chinese and Malay languages was done by the local team in the commissioned research consulting company. They then conducted 4 pilot interviews in those languages. Minor issues were detected and rectified during the project briefing held. The NTU team, which had native speakers, was then

consulted on the Chinese and Malay questionnaires and revisions were made promptly before fielding. Similarly, the translations were done by the respective research consulting company for India and Vietnam. The NTU team (which also had native speakers of Vietnamese, Hindi and Bengali) again went through the translated questionnaires and made the appropriate revisions.

### C. Design and Data Analysis

A two-way between groups ANOVA was conducted for the TB Myths scale via SPSS with the independent variables of country (Vietnam, India and Singapore) and age groups (18-20; 21-25; 26-30; 31-40; 41-50; 51-60; 61-70; 71 and above), and the dependent variable of level of agreement.

### D. Procedure

Each team of local interviewers (8-15 of them) for the different countries were fully briefed and extensively trained, highlighting key points and potential problematic scenarios. Data collection was done in the middle of 2012 and an interviewer approached the respondents at their households as according to each country's sampling methodology (refer to section IIA). The questionnaire would be verbally administered with the help of show cards for ease of response. The interviewers would write down the answers given on paper and later code

them into an excel spreadsheet or the Statistical Product and Service Solutions (SPSS). Each interview lasted around 40 minutes. Participants were reimbursed for participation with residents in Singapore getting \$10 supermarket vouchers, and local sweets as tokens of appreciation in Vietnam and India.

## III. RESULTS

SPSS was used to collate the data and to run the analyses required. The results of the two-way between groups ANOVA for the TB Myth scale and subsequently, the results of social media use per country in comparison would be reported below. As the Levene's Test of Equality of Error Variances was significant for all three subscales, a more stringent significance level will be used (<0.01) when evaluating the results.

### A. Level of belief for TB Myths

The interaction effect between country and age groups was statistically significant,  $F(14, 2966) = 2.65, p=0.001$ , but effect size was very small, partial eta-squared = 0.012. A significant main effect for country was present,  $F(2, 2966) = 29.62, p<0.001$ , but the effect size was small at partial eta-squared = 0.02. There was no significant main effect for age. Post-hoc comparisons found that the mean score for India ( $M=3.09, SD=0.68$ ) was significantly higher than Singapore ( $M=2.85, SD=0.58$ ) and Vietnam ( $M=2.81, SD=0.49$ ). However, there was no difference between Singapore and Vietnam.

The most pervasive myth in the three countries was that excessive smoking causes TB. Interestingly, the myth that TB has no cure had the least belief in it among each country.

TABLE III. SOCIAL MEDIA ITEMS USED IN MOP SURVEY

Q1	Which social media applications do you use? <i>If no, do you plan to use</i>			
		YES	No but PLAN to use	No and DO NOT plan to use
a.	Micro-blogs (e.g. Twitter, Tumblr)	1	2	3
b.	Blogs (e.g. Blogspot, WordPress)	1	2	3
c.	Collaborative projects (e.g. Wikipedia, Wiktionary)	1	2	3
d.	Social networking sites (e.g. Facebook, MySpace)	1	2	3
e.	Content communities (e.g. YouTube, Flickr)	1	2	3
f.	Virtual social worlds (e.g. Second Life, HandiPoints)	1	2	3
g.	Virtual game worlds (e.g. World of Warcraft, Sims)	1	2	3
Q2	Which statement <u>most</u> closely describes you? (Read out and choose 1)			
	a.	I am skeptical of social media and have no intention to use it at all		
	b.	I am not using social media but would like to try it		
	c.	I am using social media and consider myself a "beginner"		
	d.	I use social media tools and consider myself an "advanced user"		
	e.	I consider myself an "expert" when it comes to social media		

In general, people agreed that TB is a hereditary disease but were fairly neutral or even disagreed with other myths such as TB being a lower socioeconomic class disease and that a TB infection will always turn into a TB disease.

### B. Social Media Usage

For this analysis, only 2,452 respondents from the three countries had valid answers. Of those who were skeptical of social media and had no intention to use it at all, India had the most skeptics at 37% in its own country than compared to Vietnam (20.5%) or Singapore (24.1%). Within India, the age group that was most skeptical was those 31-40 years old, whereas it was the 51-60 years old group that was most skeptical for Vietnam and Singapore.

At the same time, India (26.5%) had the most potentials looking forward to trying social media even though they may not be using it yet. 12.4% and 14% in Vietnam and Singapore respectively were willing to give social media a try.

A total of 49.2% in Vietnam considered themselves as social media users, of which 60% of them were beginners. 28.9% in India considered themselves as social media users, of which 52% in that sample were considered to be beginners. Singapore had the most social media users at 57.4%, of which 50% and 42.7% considered themselves as beginners and advanced users respectively.

Half of those who are 18-20 years old in Vietnam believed themselves to be advanced social media users, while the rest of the age groups majorly either fell into the beginner user type or have no intentions to use social media at all. About 32% of those who are 18-20 years old in India did not use social media but would like to try it out.

In terms of social media applications (e.g. microblogs, social networking sites, blogs, content communities or virtual worlds), the highest number of current users in total for Vietnam is in the 21-25 years old group, with Singapore's in

the 41-50 years old group, and the 31-40 years old group for India.

## IV. DISCUSSION

Using quantitative means, this study investigated the level of belief the general population has towards common TB myths in Vietnam, India and Singapore and social media usage in these countries. As TB is a stigmatized disease, we argue that differentiated strategies employing different types of social media targeted for different age groups should be used to dispel TB myths and misinformation.

Overall, the people in India are more susceptible to TB myths than Vietnam or Singapore. Those in India within the 18-20 years old age group believed much more in the myths than the other countries. The significant interacting effect between countries and age groups on the level of belief in the TB myths suggested that the effect of age does depend on which country was involved. Those who were 71 years old and above in Vietnam and Singapore believed in the myths more so than those in the same age group in India. The older the population in India got, generally the less they believe in such myths. Whereas in Vietnam and Singapore, it was those between 18-25 years old that did not believe in the myths as much. This perhaps could be evidence for the types of education, literacy and even personal experience as influencing factors for the level of belief in TB myths.

### A. Differentiated strategies

From the results, it could be seen that the use of social media currently lies in the hands of the younger generation. Singapore seemed to be the most advanced in the use of social media technologies and is ready now for the rollout of such technologies for purposes of healthcare education. Given a few more years and better access of infrastructure for media, India and Vietnam would be ready.

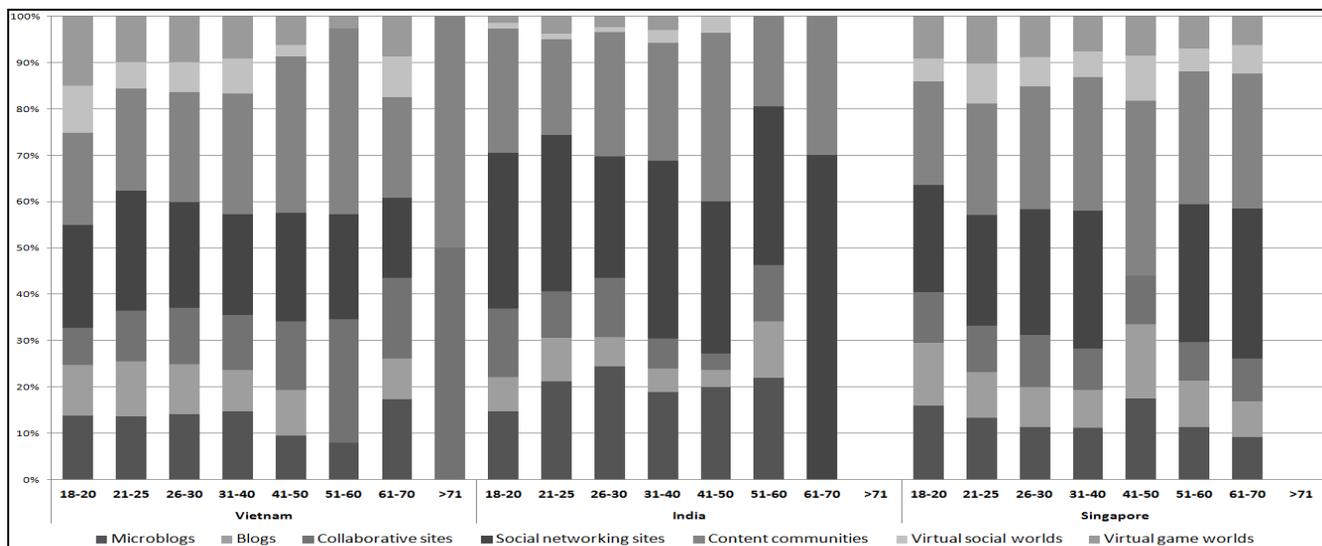


Fig. 1. Percentages of different types of social media applications usage.

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One thing to note is that though there seemed to be interest in using social media for health information; it may not necessarily mean that such behaviours for information seeking would be sustained. A concern for the uptake of social media technologies in India would be the digital divide and unequal access of hardware infrastructure that makes it necessary to get information from [19]. Therefore differentiated strategies are recommended for the three countries even according to age groups. The 100% stacked column chart in Fig. 1 shows the different types of social media applications that each age group per country currently uses. As seen, social networking sites and content communities are used more across the countries and age groups. Those older than 71 years do not use these applications at all aside from Vietnam. Microblogs are a good option when targeting the younger population under 30 years in India. A good proportion of people do use content communities such as YouTube or Flickr, and these are good platforms for health educators to inform and correct people on any myths and misinformation.

### B. Limitations and Future Work

There are a few limitations in this study. First, the number of items for the TB Myths scale may not be comprehensive enough to cover every type of TB myths out there in the different societies. Perhaps a specific scale developed for each individual country with a more comprehensive list of myths would serve policymakers and health service providers a better understanding of their own country's profile. However, there are also common myths that transcend beyond cultural and country barriers to keep in mind too. Second, this was just a preliminary exploration to the social media usage of the MOP (middle class) population in the three countries and more quantitative scales are required to fully measure the current state and future usage of social media technologies for healthcare. The questions about using social media to dispel TB myths and misinformation were separated in this study. Future research could integrate these two constructs such that it would be more easily valid in understanding whether potential users in the community are interested in using social media not just for seeking information, but the active changing of perceptions, attitudes and behaviours towards TB, bearing in mind any moderating variables such as education.

## V. CONCLUSION

Myths and misinformation about TB are present in the three countries of both developing and developed economies. Differentiated strategies targeting each specific country are recommended. The varied access and interest to technologies among the age groups should be a consideration in determining which medium to be used in disseminating health information. The younger population will be more adept and ready for social media technologies that could help in debunking the pervasive TB myths that exist in the diverse societies today.