

## SOCIAL DETERMINANTS OF TUBERCULOSIS IN DEVELOPING COUNTRIES

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### ABSTRAK

**Background:** The middle - income countries are the highest TB contributors in the world. The trigger for TB is not only identified from the medical aspect but is also related to social determinants of health. Literature review of relevant studies of social determinants of TB can contribute a more comprehensive understanding than that obtained from individual studies alone. It can support the findings and interpretation of one study; describe differences or friction in the findings of the study; facilitate the emerging of new theories; and disseminate the design of new interventions.

**Methods:** The literature search was conducted using the databases of Google Scholar and Scopus. It was performed for a period of one week (12 th–19 th April, 2016). Inclusion criteria were: Articles were published in the period of 2001- 2016, the articles were written in English and studies were conducted in developing countries.

**Results:** Malnutrition, poverty, inadequate housing, educational status, urbanization, and unemployment were the themes emerging from the synthesis process.

**Conclusions:** There were six factors of social determinants of TB that emerged from this literature review. It includes poverty, inadequate housing, malnutrition, educational status, urbanization and unemployment. All the factors are strongly related and tend to have a combined effect as the social determinants of TB

### Informasi

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**Kata kunci:** *social Determinants, Tuberculosis, Developing countries*

## Introduction

The main causes of morbidity and mortality in developing countries is tuberculosis (Rodrigues & Smith 1990). The middle - income countries are the highest TB contributors in the world (WHO 2012). The trigger for TB is not only identified from the medical aspect but is also related to social determinants of health (WHO 2010). Tuberculosis and its negative effects are generated by a number of factors which include genetic, physical, biological, social and economic (Blas & Kurup 2010).

The role of social determinants of health in influencing health outcomes for various health conditions has been disseminated widely (Gesese et al. 2016). Raising awareness of the importance of social determinants of health, especially in regard to HIV / AIDS, has increased interest in exploring the role of social determinants of TB. The emerging consensus indicates that progress in controlling TB in the middle - income countries must not only focus on strengthening TB control programs, diagnostic techniques, and treatment but also needs action on the social determinants of TB (Hargreaves et al. 2011). The incidence of tuberculosis has declined dramatically in high-income countries with low rates of immigration, child mortality and HIV infection. Furthermore, it also happens in countries with a higher access to sanitation, human development index and greater health expenditure (Dye, C et al. 2009).

Literature review of relevant studies of social determinants of TB can contribute a more comprehensive understanding than that obtained from individual studies alone. It can support the findings and interpretation of one study; describe differences or friction in the findings of the study; facilitate the emerging of new theories; and disseminate the design of new interventions. Furthermore, it provides the

gaps which will be identified in present social determinant studies (Munro et al. 2007).

This review will consider the social determinants of TB in developing countries. The results of this review will have implications for all stakeholders who are working together in terms of controlling TB epidemic.

### The extent of the problem

Tuberculosis is one of the top ten leading causes of death in the world (Borgdorff, Floyd & Broekmans 2002; Dye, Christopher et al. 1999). It has been estimated that roughly one-third of the world's population is infected with mycobacterium tuberculosis, and that each year 8 million people develop tuberculosis disease and about 2 million die of it (Boutayeb 2006). Southeast Asia and Africa are the highest contributors of TB cases. The TB situation over the last two decades is exacerbated by the HIV / AIDS epidemic and multidrug resistance. The major cause of death of people with HIV is Tuberculosis, and in countries with high prevalence of HIV, approximately 80% of TB patients are HIV-positive (Dye, C 2000; Ruxin et al. 2005).

In addition to serious physical disorders that are experienced by TB patients (Aggarwal 2010), they also experience social impacts including job loss, disruption in family life, and rejection by family members and the local community (Lawn 2000). Furthermore, the cost of TB in lost productivity is approximately US \$ 3.3 billion per year (Boutayeb 2006).

## Methods

### Search Strategy and Study Selection

#### *a. Source of information*

In this study, a systematic search technique is used to identify the research studies that are relevant to the search topic (McFadden et al. 2012). The literature search was conducted using the databases of Google Scholar and Scopus. It was performed for a period of one week (12 th–19 th April, 2016). At least two databases according to the field of study were used in the literature search in order to provide reasonable breadth and depth of understanding of the topics. The breadth and depth of the search are determined by the topic and purpose (Green, Johnson & Adams 2006).

### ***b. Search terms and delimiting***

Certain parameters in the literature search are determined to make the project feasible because it is inefficient if every single paper that has a slight relationship to a research topic should come under review (DePoy & Gitlin 1994). Social Determinant, Poverty, Unemployment, Tuberculosis and Developing Countries were the key words that were used in this literature search. This review uses the PICO concept, MeSH (Medical Subject Heading) and Boolean logic “AND” & “OR” in searching relevant literature (Jones, K 2007, p. 40).

### ***c. Inclusion and Exclusion Criteria***

A literature search requires a determination of the specific criteria to improve the

effectiveness and efficiency of a project (DePoy & Gitlin 1994). Preference criteria that are used to include or exclude the study from the review should be informed (Gehlbach 1993; Hutchison 1993; Oxman 1994; Slavin 1995). It helps keep the focus of the research and ensures that these criteria were made because there was a relationship with the subject rather than reflecting the desires of the author himself (Oxman & Guyatt 1988). The research question is a guideline in determining the inclusion and exclusion criteria (Kitchenham 2004).

Parameters that are defined in this stage should be sufficiently comprehensive to ensure that authors can take all relevant studies (Oxman & Guyatt 1988). The studies outside the domain of research purposes can be entered unintentionally or inappropriately if too many exclusion criteria or too wide an inclusion criteria are used (Green, Johnson & Adams 2006). Green, Johnson and Adams (2006) state that the inclusion criteria illustrate the author's considerations to involve a paper in a review process. In addition, the exclusion criteria describe the author's considerations to omit studies that are not related to the objective of the research focus. The inclusion and exclusion criteria are presented in detail in Table 1.

**Table 1. Inclusion and Exclusion Criteria**

No	Inclusion Criteria	No	Exclusion Criteria
1	Articles were published in the period of 2001- 2016.	1	Articles were published before 2001.
2	The articles were written in English.	2	The papers were not written in English.
3	Studies were conducted in developing countries.	3	Studies were conducted in developed and poor countries.

## **Results**

### ***a. Management Result***

It is essential to disclose the databases that were used to search for articles (Gehlbach

1993; Oxman & Guyatt 1988). It helps authors to monitor the database and terms used, and also report the results to the readers (Green, Johnson & Adams 2006). In terms of data management, the papers

found were stored in the Endnote system. The results of this systemic search technique will be put in a literature tracking sheet (Table 2).

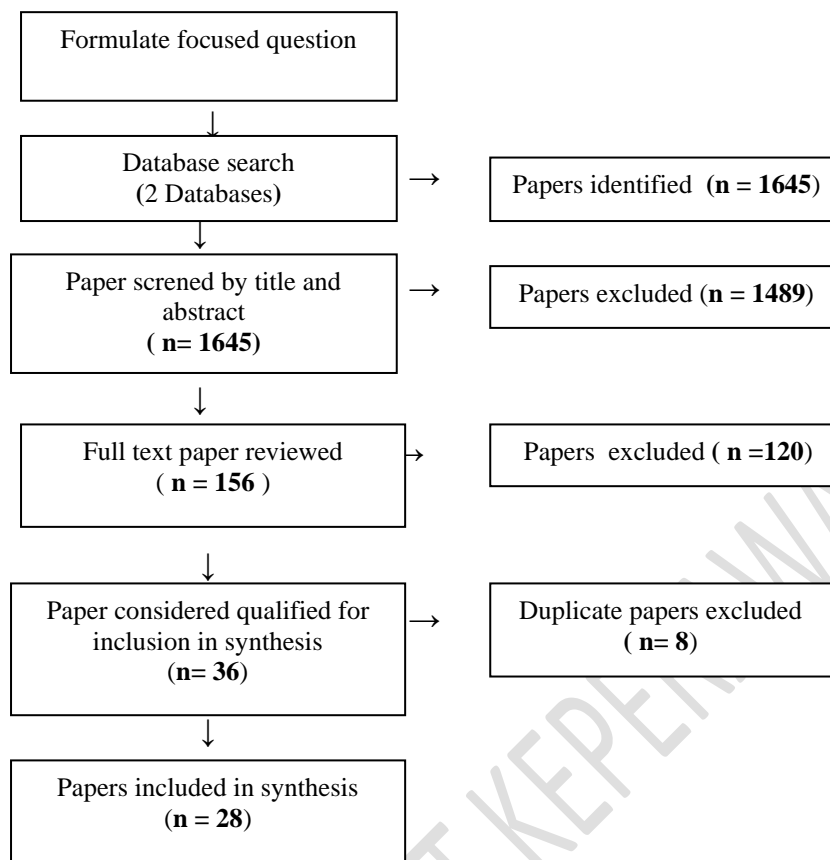
**Table 2. The Literature Tracking Sheet**

Date of search	Database	Year Searched	Search terms	String of Terms	Hits
12 April 2016	Scopus	2001-2016	Social Determinants	Social Determinants AND Tuberculosis	59
13 April 2016	Scopus	2001-2006	Poverty; Tuberculosis	Poverty AND Tuberculosis	392
14 April 2016	Scopus	2001 -2006	Unemployment ; Tuberculosis	Unemployment AND Tuberculosis	214
19 April 2016	Google Scholar	2010-2016	Social determinants Tuberculosis Developing countries	Social determinants of tuberculosis in developing countries	980
T O T A L					1645

There were 1645 citations identified in the various databases and retrieved abstracts for potentially relevant studies. The next step was filtering titles and abstracts of potentially relevant studies, excluding 1,489 papers and retrieving potentially eligible papers (n=156). Scanning in depth the summary or abstract of the studies was the next step. At the beginning of the article published there is usually a summary or abstract. It will facilitate the selection

process and the determination of whether the decision is made that the article needs to be read more or excluded (Cronin, Ryan & Coughlan 2008). After scanning the whole text, 120 papers were not qualified and 36 papers were potentially qualified. After that, duplicate papers were excluded, leaving 28 papers that were qualified. Finally, only 28 articles were qualified for the final synthesis process.

**Figure 1. Search Process and Study Selection**



### ***b. Analysis and Synthesis***

Green, Johnson and Adams (2006) argued that the heaviest segment in doing narrative review is synthesis. A lot of energy is required to synthesize all the information that is attained from the literature search into a comprehensive paragraph. The content and thematic analysis were used in this narrative review. These analyses are effective in systematically indentifyng the characteristic and focus on the theme from the articles (Magarey, Rogers & Veale 2000). There were several steps to identify

#### *Poverty (low socio economic status)*

Poverty (low sosioeconomic status) is one of the themes that arose in this review. Poverty was the prominent theme that emerging from most studies. Most of the studies revealed that there is a strong association between TB and poverty (Acosta & Bassanesi 2014; Amwayi,

the themes in this review. The first phase was skimming and scanning of the articles was done. After that, reading in depth and rereading the included studies. Assigning a code for each emerging theme was the next phase. The ultimate phase was to merge the code that has the same focus into one main theme.

### ***c. Description of themes***

Malnutrition, poverty, inadequate housing, educational status, urbanization, and unemployment were the themes emerging from the synthesis process.

Kikuvi & Muchiri 2010; Boccia et al. 2011; Egbagbe, Okojie & Amaize 2011; Gyawali et al. 2012; Jethani et al. 2013; Miandad et al. 2015; Odone et al. 2013; Romaszko et al. 2008; Shafee et al. 2013; Tipayamongkholgul, Podang & Siri 2013; Wong et al. 2013). The other study highlighted that the poor will most often be

infected with TB if they have associated comorbidities such as Malnutrition, diabetes, and HIV (Arianna, MaríaTeresa & Carlos 2014).

Muniyandi and Ramachandran (2008) found that the prevalence of TB occurs significantly more in the poor rather than the rich. Tuberculosis was 1,5 times more common among people who are marginalized. Furthermore, TB was higher among people living with a low SLI (standard of living index) than among those with a medium or high SLI (Muniyandi & Ramachandran 2008). The significant evidence proves that there was a positive association between sputum-positive TB Case Notification Rates (CNRs) and household poverty rates (Wong et al. 2013). Another study states that the poor are more susceptible to TB than the rich (Oxlade & Murray 2012).

#### *Inadequate housing*

There was a relationship between TB and inadequate housing (Jurcev-Savicevic et al. 2013). The others studies found that tuberculosis has a positive association with household hygiene and poor ventilation (Harling, G., Ehrlich & Myer 2008; Kiboss & Kibitok 2003; Miandad et al. 2015; Taher-Ghasemi et al. 2016; Tesema et al. 2015). Furthermore, some studies reveal that the risk of TB was increased because of crowding in the household (Firdaus & Ahmad 2013; Gyawali et al. 2012; Kiboss & Kibitok 2003; Kibret et al. 2013; Shafee et al. 2013; Sial et al. ; Tesema et al. 2015). Another study highlights that the the risk of tuberculosis was increased because of indoor air pollution (Oxlade & Murray 2012).

#### *Educational status*

Some studies found that there was a relationship between tuberculosis and educational status (Abdallah & Ali 2012; Harling, G., Ehrlich & Myer 2008; Hussain, H, Akhtar & Nanan 2003; Jethani et al.

2013; Jurcev-Savicevic et al. 2013; Kaulagekar & Radkar 2007; Miandad et al. 2015; Tesema et al. 2015). The others studies reveal that illiteracy was a risk factor contributing to tuberculosis dissemination (Shafee et al. 2013).

#### *Malnutrition*

Some studies found that there was a correlation between tuberculosis and malnutrition (Boccia et al. 2011; Ramachandran et al. 2011). One study proves the risk factor contributing to the dissemination of tuberculosis was malnutrition (Shafee et al. 2013). Furthermore, a single study stated that low body mass index (BMI) found in the poorest populations had a strong mediating effect on the relationship between TB and poverty (Oxlade & Murray 2012).

#### *Unemployment*

Some studies reveal that there was an association between TB and unemployment (Harling, G., Ehrlich & Myer 2008; Jurcev-Savicevic et al. 2013; Ladefoged et al. 2011; Tipayamongkhogul, Podang & Siri 2013).

#### *Urbanization*

A single study points out that there was an association between TB and urbanization (Miandad et al. 2015).

## Discussion

The themes which were identified in this narrative review are strongly related and tend to have a combined effect as the social determinants of TB.

### **Poverty**

Among environmental, biological and social factors of tuberculosis, most include the poor people. Risk factors identify poverty as a fundamental trigger of TB (Harling, Guy & Castro 2014; Oxlade & Murray 2012). However, the mechanism of how poverty can directly cause tuberculosis remains unclear. Poverty may cause a

person to have nutritional deficiencies, which are likely to make the immune system more vulnerable to infection organisms such as *Mycobacterium tuberculosis* (Spence et al. 1993). The contributions of poverty in TB incidence is undoubtedly through increased development of infectious diseases caused by poor diet, stress, and difficulty in accessing health services (Lönnroth, Knut et al. 2010).

The transmission of *Mycobacterium tuberculosis* is facilitated by poverty, especially in these three ways. The first is the effect of poverty on living conditions, such as people living in overcrowded and poorly ventilated houses (Marais, Hesselings & Cotton 2009). The poor are forced to live in unhealthy housing that support the viability of the *Mycobacterium* (Miandad et al. 2015). The second way is prolonged diagnostic delay (Marais, Hesselings & Cotton 2009). Poor people do not visit health facilities for check-ups and as well as their difficulty in purchasing TB drugs due to lack of money (Miandad et al. 2015). The third way is the vulnerability of the poor to TB being increased because of malnutrition (Marais et al. 2005). Poverty decreases the ability of people to buy and consume a nutritious food, and that ultimately reduces their immune system (Miandad et al. 2015).

### **Inadequate Housing**

The relationship between health and the house of the inhabitants is one of the most important that exists (Lowry 1991). Health status of residents is determined by the quality of their housing conditions (Jackson 2003). There are some of the most relevant health threats found in a residence such as indoor air quality, humidity and mould growth, room temperature, asbestos, lead, radon, volatile organic compounds (VOC), lack of hygiene and sanitation equipment, and crowding (Bonney 2007). The physical environment in which the contact

takes place will determine the high risk of exposure to infectious droplets. Crowding and poor ventilation, for example in households, in health care settings, in workplaces, in public transportation and in prisons, enhances the risk of high exposure and therefore the risk of infection (Menzies, Joshi & Pai 2007; Rieder 1999).

Crowding, poor hygiene and sanitation are still classic fundamental problems of growing settlements and large cities, most of which are located in developing countries (Bonney 2007). Population density also increases the spread of TB, and there was a very positive correlation between these (Ploubidis et al. 2012). TB becomes contagious and spreads more rapidly among the poor people of developing countries where most of them live in houses built of mud/stone/wood/brick, etc (Miandad et al. 2015).

Crowded housing conditions can increase the exposure of people who are susceptible to patients with respiratory infectious diseases, and thus can increase the likelihood of transmission. The existence of a relationship between the quality of housing and the incidence of TB and TB mortality has long been recognized (Hawker et al. 1999). Lack of mobility in a settlement, has a tendency to support stability in the spatial distribution of the infection (Myers et al. 2006). The high prevalence of TB associated with crowding has a plausible biological explanation in that there is an extensive degree of shared airspace in crowded dwellings, which will increase the exposure to *Mycobacterium tuberculosis* (Cantwell et al. 1998).

### **Educational Status**

Education is an essential power of human civilization that gives preference to people about the kind of life they want, and empowers them to express their vision

among the populations in which they live and also to gain confidence in their personal interaction (UN 2005). Miandad et al. (2015) point out that educational attainments are stepping-stones for ensuring and using better-earning chances which nurture the roots of the quality life of human beings. It offers socioeconomic status and solidity to its owners. In addition, it provides a variety of alternatives to individuals so that they can manage their lives. Furthermore, educational achievements creates awareness about the importance of all aspects of life including health and disease (Khan et al. 2006). Uneducated population are generally responsible for the social and economic problems that arise, and lack of education is considered as the main cause of underdevelopment in densely populated settlements (Burke et al. 2008).

### **Malnutrition**

Malnutrition is a state of multi-deficient (energy, protein, and other nutrients) that leads to measurable adverse effects on tissue, body form and function, and clinical outcomes (Joosten & Hulst 2008). It occurs as a result of inadequate intake, increased losses, or altered absorption (Meijers et al. 2010). Malnutrition is a crucial determinant of tuberculosis incidence in a population with substantial latent TB infection. Malnutrition has a great effect on the function of cellular immunity (Cegielski & McMurray 2004).

Malnutrition is an essential risk factor for tuberculosis (TB) because cellular immunity (CMI) is the key host immunity against TB (Chandra 1991; Gershwin 2012). Malnutrition reduces the immune system and enhances the opportunity of the host's receptiveness to infection (Miandad et al. 2015). The host's protective immune mechanism for infection with *Mycobacterium tuberculosis* depends

critically on the interaction and cooperation between monocyte-macrophages and T-lymphocytes and their cytokines (Rook & Hernandez-Pando 1996). Primary or latent infection of TB will develop into active disease in individuals with malnutrition (Chandra 1991).

Miandad et al. (2015) state that diet and TB are related to each other. A balanced diet helps keep the immune system healthy and then all inclusive types of resistance against mycobacterium became active. The increasing population density is indicated by extended poverty, food insecurity and limited access to a healthy diet. These factors are most likely to cause TB epidemics. In addition, these three factors are interlinked in a vicious cycle. It is difficult to disentangle the influence of nutrition against tuberculosis because of the whole complex of coincidental environmental factors. Gupta et al. (2009) argue that the high prevalence of HIV infection exacerbates the problem of malnutrition and TB in developing countries. HIV infection is a significant factor in exacerbating the nutritional status of patients.

Furthermore, malnutrition leads to increased vulnerability of children from lower income families against infectious diseases. Unhygienic environmental conditions in the provision of food enlarges the risk of exposure to disease (Hussain, A 2003). In addition, in these complex circumstances, the effects of malnutrition cannot be separated from the effects of poor housing, overcrowding, lack of medical care, poor hygiene, massive social disruption, etc (Cegielski & McMurray 2004).

### **Urbanization**

The incidence of TB is commonly much higher in urban communities than in



countryside (Lönnroth, K, Zignol & Uplekar 2006). In some urban areas, TB death rates are close to 1% per year (Rieder 1999). Rapid urbanisation can create ideal conditions for the development of TB epidemics. It can be prevented if urbanization is accompanied by good urban planning, social reform, environmental protection, and if urban health systems are strong and well coordinated (Kjellstrom et al. 2007). Urbanization leads to an increase in population density, living and working conditions are overcrowded, and increased mobility due to the migration of rural people to urban areas to find temporary work (Blas & Kurup 2010). Furthermore, urbanization led to increased exposure to TB risk factors such as smoking, alcohol abuse, unsafe sex, and unhealthy diet. It happens because of the socio-cultural transition that quickly leads to a pattern of health behavior changes (Kjellstrom et al. 2007).

### Unemployment

Many studies found that unemployment is an important risk factor for TB (Przybylski et al. 2014). The results of the study in Croatia revealed that 23% of unemployed people have TB (Jurcev-Savicevic et al. 2013). Unemployment people in Greenland have a TB risk more than four times higher than the employed (Ladefoged et al. 2011). Furthermore, Brazilian researchers revealed that unemployment was a risk factor for TB and there were significant treatment delays caused by unemployment (Machado et al. 2011). However, there are no convincing data concerning a relationship between unemployment and TB in the accessible available literature, but if you combine other social factors with unemployment, there is more tuberculosis in these social groups (Yang et al. 2004).

The financial crisis may expand the size of the groups with a high risk of incidence of tuberculosis. Unemployment is an example, where job insecurity appears to

lead to behavior that increases the risk of tuberculosis, such as higher alcohol consumption. The recent economic recession caused unemployment and the increasing of the homeless population, both of which are risk factors for tuberculosis (Coker et al. 2006; Ladefoged et al. 2011). Long-term unemployment can increase poverty and its additional social pathologies, and increase the incidence of TB (Przybylski et al. 2014).

### Conclusion

There were six factors of social determinants of TB that emerged from this literature review. It includes poverty, inadequate housing, malnutrition, educational status, urbanization and unemployment. All the factors are strongly related and tend to have a combined effect as the social determinants of TB. Poverty, unemployment, and lack of education and knowledge increase the susceptibility of families and individuals and affect their capacity to obtain and consume healthy food, live in a healthy dwelling, and have access to health services and products (Blas & Kurup 2010). The primary factor in the social determinants of TB in middle – income countries is poverty. Poverty has an important role as a social determinant and a risk factor contributing of tuberculosis dissemination in low and middle – income countries.

A comprehensive understanding of the rationale behind socio-economic gradients, and the existence of a relationship between an increased risk of TB with poverty, will assist to identify extra entrypoints for interventions that target more lower status groups' determinants. Furthermore, TB programmes must be dynamically engaged in all national and local plans to eradicate poverty and improve living conditions. For example, the development of poverty reduction strategy papers, microcredit

schemes, vocational training and other forms of social support for TB patients and family are vital. With this involvement, the TB program is expected to encourage equitable access and economic protection for the poor. It provides a positive health impact of TB treatment and the improving of labor productivity, which in turn will contribute to equitable economic development (Blas & Kurup 2010).

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