

# Porcine cysticercosis and human neurocysticercosis: evidence-based research trends

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## Abstract

The research indicates that roughly 50 000 humans die annually due to veterinary public health- food safety related issues of *Taenia solium* of pigs. However the exact socio-economic impact of *T. solium* is not fully understood and often appears to be conjecture due to conflicting and competing opinions among the policy makers and scientists. The aim of the study was to evaluate existing data in order to understand the current research focus in support of evidence-based decision making in medical and veterinary services. Meta Analysis Approach was utilised in the following criteria: First, the orientation of the paper was catalogued i.e. diagnosis, prevention, treatment or control. In the second step, the disease incidence and prevalence data was evaluated for which the level of a disease was utilised as a proxy for the potential impact. In 268 papers analysed, 48% of the studies dealt with case reports, outbreaks, or offered estimations of the incidence and/or prevalence. The literature in Bolivia (76%) and South Africa (92%) tended to be heavily biased towards human neurocysticercosis. In-fact the last published slaughterhouse survey of porcine cysticercosis was conducted nearly 40 years ago. The socio-economic impact of *T. Solium* appears to have been largely overlooked.

## Introduction

Lack of quality animal health delivery systems is considered to be one of the key challenges facing the communities of the developing world (Bruckner *et al.* 2002). Zoonotics comprise more than 150 infections of various aetiologies and also form a sizeable proportion of the new, emerging and re-emerging diseases (WHO, 1996). Rapid population growth and urbanization in many developing countries are paralleled by a rapidly increasing demand for food from animal origin. Research and surveys in recent years indicate that a zoonotic tapeworm, *Taenia solium*, is emerging as a significant problem and poses a serious public health risk especially in developing countries. It is estimated that roughly 50 000 humans die annually due to veterinary public health-food safety related issues of *T. solium* of pigs. According to Phiri *et al.* (2003), higher consumer demand and increased market value of pork in urban areas, the recognition by poor farmers of quicker and higher returns on their investment has contributed to an increased interest in raising pigs. Taeniosis/cysticercosis is associated with poor sanitation and hygiene, poor methods of pig husbandry and lack of proper meat inspection and disease control measures. Man is the natural host and pigs are the intermediate hosts. Humans may become an intermediate host from ingestion of eggs or larvae (cysticerci). The cysticerci may then lodge in the brain causing cerebral cysticercosis (neurocysticercosis). This resulting in headache, epileptic seizures, blindness, mental disturbance and even death ( Phiri *et al.* 2003; White, 2000). Although more attention has been paid to the role of *T. solium* in recent decades, practitioners often lack objective tools to measure impacts. The literature indicates that the exact socio-economic impact of *T. Solium* is not fully understood and often appears to be conjecture based on expert opinion with the direct evidence often lacking. Research prioritisation studies indicate that there are often conflicting and competing opinions among the policy makers and scientists. In view of the allocation of research resources by the policy makers, evidence-based decision making has been advocated (LGG, 2004). The aim of the study was to evaluate existing data in order to understand the current research focus in support of evidence-based decision making in medical and veterinary services.

## Methods

Veterinary and medical databases such as PUBMED and CAB abstracts were searched using different keywords for articles published on *T. solium*, ciysticercosis and neurocysticercosis. The European version, MEDLINE, was also searched to ensure that no other papers were missed excluded by PUBMED because of language. Other relevant databases such as Cambridge Abstracts, Science Direct, British Library theses database, Google Scholar were also searched for conference proceedings and theses. Online libraries of other institutions/

organisations involved in international/African development such as FAO, Eldis, IFAD, ILRI, etc were searched for relevant articles. In the second step the list of references of the identified papers was searched step by step for further references. Literature from developmental studies and unpublished reports was obtained through colleagues, experts and web. Papers were then grouped according to their primary topics which they address. A total of 268 papers were analysed of which 197 were from the southern and east Africa. The orientation of papers were catalogued i.e. diagnosis, prevention, treatment or control. In the second step, the disease incidence and prevalence data was evaluated for which the level of a disease was utilised as a proxy for the potential impact. Once grouped, papers that dealt with prevalence / incidence and economic impact were further explored with the aim of conducting statistical analysis. Each paper was scrutinised for the evidence of the primary research. Papers that only mentioned the prevalence as a reference to other studies or national statistics that have already been used were eliminated. Furthermore, reports that only mentioned number of outbreaks/cases without mentioning the total population affected were excluded. Studies that only dealt with samples of suspected cases were also excluded as these are likely to be highly positive than usual. The mean prevalence percentages was calculated and expressed as weighted mean to make an allowance for the number of animals (sample size) to be added for each study and the overall sample size and prevalence was calculated.

## Results and discussions

*T. solium* is considered to be an important emerging zoonotic and public health disease. The interest and importance in developing countries is evidenced by Cysticercosis Working Groups in Africa, Asia and South America that have been established (Krecek, 2003; Phiri *et al.*, 2003). Results indicate that nearly half (48%) of *T. Solium* literature from the Southern and Eastern Africa dealt with case reports, outbreaks, or offered estimations of the incidence and/or prevalence (Table 1).

**Table 1.** Literature of cysticercosis in Southern and East African Countries

Primary topics of papers	No of papers	Percentage (%)
Prevalence/Incidence	94	48
Economic/ social impacts	26	13
Diagnosis	32	16
Treatment/Prevention/Control	26	13
Other	19	10
<b>Total</b>	<b>197</b>	<b>100</b>

More interestingly was the variation between and within various countries with the regard to the species emphasis as demonstrated in table 2. A number of countries had reported high number cases of human neurocysticercosis but had very limited literature on the prevalence of the disease in pigs, probably indicating the poor cooperation between the medical and the veterinary profession. The literature in Bolivia (76%) and South Africa (92%) tended to be heavily biased towards human neurocysticercosis (Table 2). The meta-analysis results across all studies indicated that the mean prevalence of human cysticercosis for Bolivia, India and South Africa was 12.1 %, 23% and 11 % respectively.

**Table 2.** Orientation of papers

	Bolivia (%)	India (%)	South Africa (%)
Porcine	24	48	8
Human	76	52	92
Total	100	100	

The ‘picture’ of biasness towards human neurocysticercosis South Africa was also derived when Bovine cysticercosis or other *Taenia* related studies were added to the sample within Southern and East African countries (Table 3). In this regard Zimbabwe presented more balanced approach in terms of literature produced, but other countries were rather disproportional. The bulk of the literature came from cysticercosis caused by *Taenia saginata* in bovine in Kenya. The picture was however strangely different in South Africa where the

bulk of the literature came from the human cases of neurocysticercosis caused by *Taenia solium* transmitted from pigs.

**Table 3.** Inter-country emphasis

<b>Country</b>			
<b>Species</b>	<b>Kenya (%)</b>	<b>Zimbabwe (%)</b>	<b>South Africa (%)</b>
<b>Porcine</b>	16	29	8
<b>Human</b>	19	50	79
<b>Bovine</b>	62	20	11
<b>Other</b>	3	1	2
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

The literature suggests a strong link between the prevalence of the human neurocysticercosis, the husbandry and veterinary related issues of pig production, and prevalence of porcine cysticercosis. With the understanding that integrated livestock disease control offer opportunities for bettering the health of humans through better and safe livestock production, it is surprising that trends in research indicate that studies have largely excluded animal cases, especially in South Africa. In-fact the last published slaughterhouse survey of porcine cysticercosis was conducted nearly 40 years ago. The socio-economic impact of *T. Solium* appears to have been largely overlooked.

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