HEALTH PROMOTION APPROACH FOR THE CONTROL OF FOOD-BORNE PARASITIC ZOONOSES IN NEPAL: EMPHASIS ON AN ENVIRONMENTAL ASSESSMENT

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Abstract. Green and Kreuter define health promotion as the use of both education and ecology to encourage and support living conditions conducive to good health. Their PRECEDE-PROCEED model delineates a practical way to cope with health problems using this definition. Applying PRECEDE to Nepal helps identify the steps needed to control the ever-increasing incidence of food-borne parasitic zoonoses (FBPZ) there and in other South Asian countries. In executing the first five steps of the model, we focused on behavioral and environmental assessments to find a method for controlling FBPZ. Through these two assessments, we identified the following behavioral and environmental objectives: establish a meat inspection system by 2003, establish training programs on safe meat production and selling practices by 2003, improve slaughterhouses and slaughtering practices by 2003.

The educational and ecological assessments revealed that the necessary predisposing, reinforcing and enabling factors for appropriate control of FBPZ are present in Nepal, while an administration and policy assessment shows Nepal meets PRECEDE requirements through its recent meat inspection legislation. Although the data for each element of the PRECEDE-PROCEED model are limited in Nepal, they clearly tell us to move forward to the PROCEED stage to control FBPZ there as well as in all of South Asia.

INTRODUCTION

In the 1990 Seminar on Food-Borne Parasitic Zoonoses (FBPZ), several researchers voiced concern over FBPZ control in their countries. Primary concerns included: (a) wide-spread consumption of raw fish and meat (Eduardo, 1991; Ramasoota, 1991; Xiaopeng, 1991); (b) low prioritization of FBPZ control in governmental agendas (Ko, 1991; Pozio, 1991); (c) lack of control over imported food quality (Singh *et al*, 1991; Ko, 1991; Kamiya and Ooi, 1991; Schantz *et al*, 1991). These concerns indicate that we must go beyond epidemiological findings and identify ways to control the spread of FBPZ. Yet, while these concerns were clearly at the front of researchers' minds, only a handful discussed solutions to the FBPZ problem.

This study uses a health promotion approach, the PRECEDE-PROCEED model, defined by Green and Kreuter (1991, 1999) as the use of both education and ecology to encourage and support living conditions conducive to good health, to identify solutions to the FBPZ problem in Nepal. PRECEDE-PROCEED is a comprehensive model, addressing both behavioral change and environmental factors affecting behavior.

Although PRECEDE-PROCEED has been used extensively in developed countries, its application in developing countries is still limited. It has been used in South Africa (Taylor,1999), Nepal (Jimba and Murakami, 2000), and Philippines (Sone and Nalahara, 2000), but must be fine-tuned for the special conditions in developing countries. Nonetheless, by applying PRECEDE-PROCEED in Nepal, we uncovered the current FBPZ status as well as ways to minimize the spread of FBPZ.

MATERIALS AND METHODS

We executed the first five steps of the PRECEDE-PROCEED model (Fig 1) through primary and secondary data collected in Nepal. Key informant interviews of meat producers and sellers, health professionals, and government authorities responsible for FBPZ control in Nepal also provided data for behavioral/environmental, educational/ecological, and administrative/policy assessments.

RESULTS

Social assessment

Key informant interviews revealed that not only are meat producers and sellers unaware of FBPZ, but health professionals are also unaware of these diseases, rendering them unable to detect them. Thus, not only do those individuals suffering from FBPZ go untreated, but the Ministry of Health also does not view FBPZ as a priority. Although FBPZ can be broadly categorized as a communicable disease, it did not appear in the 9th National Health Plan (1997-2002) of Nepal (Nepal Ministry of Health, 1998). Instead, when the Nepal

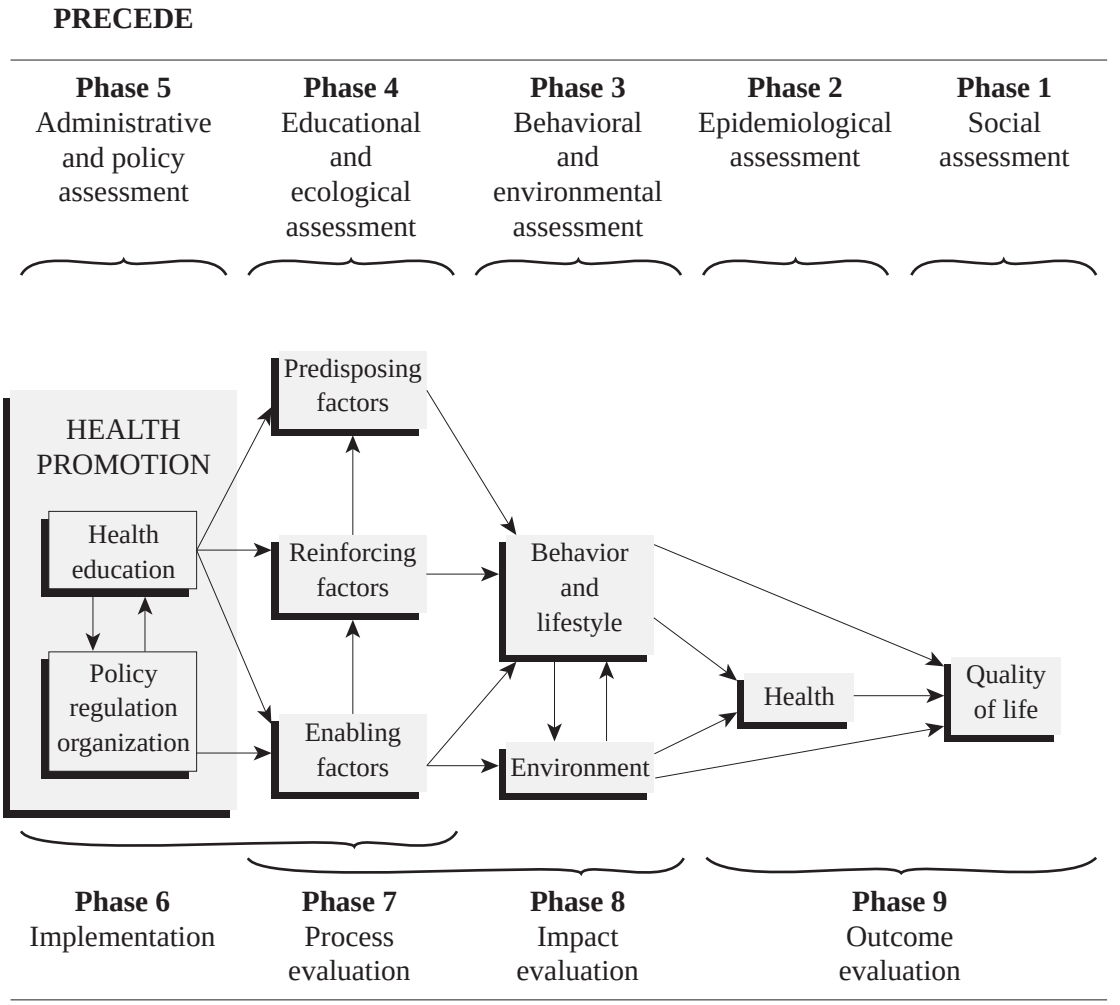

Fig 1- PRECEDE-PROCEED Model.

Veterinary Council (NVC) formed in 1999, it included FBPZ control in its priorities. Therefore, we determined to establish cost-effective methods for reducing the incidence of FBPZ and other food-borne diseases in Nepal by 2003 in consultation with the NVC.

Epidemiological assessment

Table 1 lists the types of FBPZ defined for the 1990 FBPZ conference (Tharavanij, 1991). It also includes the diseases that have been detected in the people and animals of Nepal. As some of these data were not officially published or recorded, and were not collected by the household surveys, we limited responses to Yes or No. Though these data are not sufficient to give a complete picture of the FBPZ situation in Nepal, we can extrapolate from them, and, based upon the paper-publication and information dates, postulate that the frequency of taeniasis, cysticercosis, and fascioliasis has increased to the level of a public health threat today. Further, one must remember that the absence of current research studies does not indicate an absence of a once-detected or never-detected FBPZ. Though we may focus on controlling recognized FBPZ, we must also acknowledge the threat of other unrecognized FBPZ. The same behaviors and environmental factors that encourage known FBPZ can also give rise to as-yet-undetected FBPZ.

Behavioral and environmental assessment

Behavioral assessment: Table 2 lists high-FBPZ-risk behaviors displayed by consumers, meat producers

Table 1
Epidemiological assessment.

Type of FBPZ	Detected or not	Sources
Toxoplasmosis	yes	Upadhya, 1987
Sacrosporidiosis	yes	Malakar, 1965
Taeniasis	yes	Thapa, 2000; Poudyal, 1998; Joshi, 1973
Cysticercosis	yes	Rai *et al*, 1991
Trichinellosis	yes	Gurbacharya, 1981
Opisthorchiasis	yes	Singh, 1970
Capillariasis	no	-
Angiostrongyliasis	no	-
Gnathostomiasis	no	-
Fasciolopsiasis	no	-
Fascioliasis	yes	Mahato *et al*; 2000, Acharya, 1979
Sparganiasis	yes	Iwamura, 1965

Table 2
List of behavioral risk factors for FBPZ.

Consumers
Increasing consumption of meat
Consuming raw food
Defecating on the ground
Going barefoot
Poor personal hygiene
Producers/Sellers
Slaughtering on the ground
Unhygienic food management
Poor waste disposal practice (river, road, etc)
Inspector
Inadequate meat inspection

and sellers, and inspectors, as identified through a literature review and key informant interviews.

Consumer behavior. Consumption of meat, particularly pork, chicken and duck increased significantly between 1984/1985 when meat production was 127,016 metric tons (MT), and 1991/1992 when meat production was 148,695 MT (Joshi and Olesen, 1998). As in other Asian countries, several ethnic groups prefer raw or rare-cooked meat, which greatly increases the risk of FBPZ transmission. Further, in Nepal as in India (Bhatia, 1991) and Thailand (Ramasoota, 1991), poor personal hygiene, lack of sanitary toilet facilities, and lack of proper footwear increase the risk of contracting an FBPZ.

Meat producer/seller behavior. Meat producers and sellers customarily handle meat in an unhygienic manner and dispose of offal in nearby rivers or on the ground.

Inspector behavior. Although the meat inspection act was approved in 1998, it is not being enforced, and only 15% of meat sellers in Kathmandu follow its guidelines, while no meat sellers in Lalitpur and Bhaktapur adhere to its standards (Joshi and Olesen, 1998).

Fig 2 ranks the afore-mentioned high-risk behaviors according to priority and changeability; among them the most important factors are: inadequate meat inspection, unhygienic food management, and poor waste disposal management.

Therefore, we determined the following objectives:

1. Establish training programs on safe meat production and selling practices by 2003.
2. Establish an adequate meat inspection system by 2003.

Environmental assessment: Environmental risk factors were identified through key informant interviews and a literature review (Table 3). As Table 3 indicates, the lack of appropriate slaughtering facilities in urban settings is a primary risk factor. Intestinal contents and effluents are typically scattered on slaughterhouse floors and meat can easily be contaminated (Joshi and Olesen, 1999). About 40 % of 111 slaughterhouses surveyed in Kathmandu, Lalitpur and Bhaktapur were in poor condition and extremely unhygienic (Joshi and Olesen, 1998). Further, an unstable electrical supply makes proper

	More important	Less important
More changeable	• inadequate meat inspection • unhygienic food management • poor waste disposal management Quadrant 1	• defecating on the ground • going barefoot • increasing consumption of meat Quadrant 3
Less changeable	• consuming raw food • slaughtering on the ground Quadrant 2	Quadrant 4

Fig 2- The rankings of behavioral risk factors according to importance and changeability.

refrigeration virtually impossible. In rural settings, where electricity is not available, people slaughter animals in the open air, not only polluting the environment with offa but also rendering the resulting meat product susceptible to contamination. When animals are slaughtered on riverbanks, polluted river water is used for washing the meat. Finally, animals are typically not penned or controlled, so that they have access to garbage and offal on the streets, rendering the meat contaminated even before the animal is slaughtered.

As with the behavioral assessment, we identified and categorized environmental risk factors according to priority and changeability; among them the most important factors are: dilapidated slaughter houses, and polluted slaughter locations, unhygienic water usage.

Based on these rankings, we determined the following objectives:

1. Establish model slaughter houses in each municipality (58 total) by 2003.
2. Establish training programs on hygienic slaughtering practices in rural communities by 2003.

Educational and ecological assessment

Predisposing factors: Predisposing factors are antecedents that provide a rationale or motivation for a given behavior (Green and Kreuter, 1999). From key informant interviews and literature reviews, we identified the following predisposing factors for the previously discussed high-risk behaviors:

- According to studies in eight Nepalese cities (Joshi and Olesen, 1999), more than 95 % of meat producers and sellers are unaware of meat-borne diseases such as rabies and tuberculosis.
- Each ethnic group prefers to have its own slaughtering location, making it difficult to establish a single big, modern slaughterhouse.
- Cultural and religious ceremonies include eating raw meat and it is considered impolite to reject such offerings.
- Meat consumption is becoming a status symbol.

Enabling factors: Enabling factors are antecedents to behavior that allow a motivation to be realized (Green and Kreuter, 1999). In this case, the enabling factor can be identified as a poor slaughtering environment. Key informant interviews indicate that we must improve the slaughtering environment to improve meat management. In urban settings, model slaughterhouses would help meat producers provide safe meat. In rural settings, preparing hygienic slaughtering locations would help meat producers provide a safer product. In addition to these environmental improvements, we must provide meat-production-and-marketing training.

Reinforcing factors: Reinforcing factors follow a behavior and reward or provide incentive for the persistence or repetition of it (Green and Kreuter, 1999). In the case of meat management, hotel and

	More important	Less important
More changeable	• dilapidated slaughter houses • polluted slaughter locations • unhygienic water usage Quadrant 1	Quadrant 3
Less changeable	• refrigeration Quadrant 2	• unstable electricity Quadrant 4

Fig 3- The rankings of environmental risk factors according to importance and changeability.

Table 3
List of environmental risk factors for FBPZ.

Lack of appropriate slaughtering facilities.
Polluted slaughtering locations.
Unstable electricity, lack of refrigeration.
Water pollution, unhygienic water usage.
Poor sanitation.
Animals are exposed to garbage on the street.

restaurant managers are highly aware of problems with local meat. As a result, they are willing to spend 1.5 times as much for imported meat (Joshi and Olesen, 1998). They know foreigners prefer it and will pay for it. If local meat producers become aware of this preference, they may be encouraged to follow hygienic meat management; thus, the ability to sell to a broader, wealthier market would become a reinforcing factor. The government can also encourage proper meat management by enacting, and enforcing, meat-producing and – selling regulations.

Administrative and policy assessment

Administrative assessment: The Nepal Veterinary Council (NVC), the organization responsible for FBPZ control, is quite young. Formed in 1999, it has been tasked with taking the lead in controlling all zoonoses in Nepal on a limited budget. It will require donor support for activities such as constructing model slaughterhouses. However, if NVC is empowered with budgetary assistance, it may be further empowered to improve food inspection practices by mobilizing manpower and establishing a functioning inspection mechanism.

Policy assessment: As previously mentioned, FBPZ control has been a low priority in the government's agenda. No FBPZ control programs have been planned or implemented. In addition, there has been little communication with neighboring countries about the FBPZ problem, despite the free trade that takes place across shared borders. As with polio and HIV/AIDS control programs in South Asia, international communication and coordination must take place to control FBPZ.

DISCUSSION

Though an epidemiological assessment could not quantify the prevalence of FBPZ in Nepal, it indicated teaniasis, cysticercosis, and fasciolosis as the major FBPZ in the country. It is difficult to diagnose and treat these diseases in Nepal. Therefore, it is important to identify preventive measures by recognizing risky behavior and risk-increasing environmental factors.

The first step of the PRECEDE-PROCEED model, a behavioral/environmental assessment, accomplished what the epidemiological assessment could not: it illuminated ways to reduce FBPZ presence in Nepal. Further, the predisposing factors identified through this assessment and the results of the administrative and

policy assessments coincide with the concerns voiced at the 1990 FBPZ conference and reiterated at the beginning of this paper. Thus, the solutions for Nepal may also be the solutions for other South Asian countries.

Consumption of raw meat

Some Nepalese ethnic groups consume raw meat with some regularity. This practice is deeply rooted in the culture, making it a difficult behavior to change. As mass health education is difficult, improving the environment in which raw food is made and eaten is the solution. In developed countries, the governments improved the meat inspection systems and hygiene practices among raw food producers, sellers, and consumers. In Nepal, the NVC must initiate a meat inspection system and training programs on hygienic meat production and marketing practices. The meat-producing and -selling environment must be improved before consumer education can be expected to be effective.

Low prioritization of FBPZ control in governmental agendas

Indeed, FBPZ has not been prioritized in Nepal. This is due partially to a lack of reliable epidemiological data and partially because its public health and agricultural impact has rarely been studied. Unfortunately, these types of studies can be too expensive for developing countries to execute.

Therefore, rather than focusing on the need for more data to highlight FBPZ as a problem that must be prioritized in Nepal, we must recognize that the data collected from the entire region can be applied to Nepal. Thus, it is time to focus on solutions to the FBPZ problem. The Oxford Textbook of Zoonoses (Parmer *et al*, 1998) states that improved sanitation and hygiene practices are effective FBPZ prevention methods. The World Health Organization has also identified ten golden rules for safe food preparation, including cooking food thoroughly, washing hands repeatedly, and using safe water (Adam and Motarjemi, 1998). The meat producers and sellers in Nepal do not follow these guidelines. Therefore, providing them with sanitation and hygiene training could help control FBPZ. In addition, implementing such activities could send the government the message that FBPZ control must be a high priority in Nepal. The key is to begin implementing solutions despite having minimal, though carefully studied, knowledge.

Lack of control over imported food quality

As previously mentioned, countries must follow the example set by polio and HIV/AIDS control programs. FBPZ control must move beyond the academic world and become a regional political issue. FBPZ will not disappear without such international cooperation. The FBPZ conference in Thailand provides scientists the opportunity to meet, discuss, and share their knowledge. Now, scientists must take the knowledge gained through this exchange, use it for advocacy, and share the message with policy makers and the public, making them aware so that they can also play a role in reducing FBPZ frequency. Such efforts can lead to the political prioritization of FBPZ in the region.

Regardless of the specific concerns, a comprehensive approach must be taken to control FBPZ. While epidemiological assessments are always important, it is now time to put the accumulated knowledge to use in finding solutions to the health problems facing by developing countries. Although epidemiological data is not as plentiful in Nepal as in other countries, the PRECEDE-PROCEED approach allows us to identify specific actions that can reduce the risk of FBPZ epidemics. This approach can be used in any country, and we hope Nepal becomes an example and an inspiration for other countries to take action.

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