

# Prevalence and Risk Factors of Taeniasis In Bali, Indonesia

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**Abstract.** Taeniasis is a neglected infectious disease caused by eating raw or undercooked beef/ pork (*Taenia* sp.) containing infective cysticercus larvae. Humans can become infected with these tapeworms by eating raw or undercooked beef (*T. saginata*) or pork (*T. solium* and *T. asiatica*). In rural areas of Gianyar including Guwang village, pork or beef "lawar" and roasted pig are consumed as local traditional food since long time ago as part of indigenous Balinese culture. The existence of individual slaughtering of pigs in Guwang village for ceremonies or parties without supervision from the animal health department is thought to increase the risk of taeniasis. Purpose of the study was to known prevalence of taeniasis in Banjar Buluh, Guwang Village and determine risk factors or the relationship between meat consumption and individual characteristics with taeniasis. Observational cross sectional study was used to identify taeniasis and risk factors in people living at Buluh, Guwang village consisted of 110 people. Two subjects from the group were positive for taenia egg both by direct smear methods. Proportion of taeniasis in the case group was 1.8%. The type of meat consumed, methods of meat processing, frequency of consumption, ways of obtaining meat and individual characteristics which may contribute to *Taenia* infection could not be evaluated due to limited number of positive cases.

**Keywords:** Taeniasis, Direct Smear Method, *Taenia* sp.

## 1 Introduction

Taeniasis is an infectious disease caused by the *Taenia* sp. Humans can become infected with these tapeworms by eating raw or undercooked beef (*T. saginata*) or pork (*T. solium* and *T. asiatica*) containing infective cysticercus larvae[1]. Taeniasis and cysticercosis is are still prevalent in four provinces in Indonesia namely Papua, Bali, East Nusa Tenggara and North Sumatra[2]. The highest incidence of taeniasis in Bali is found in 4 regency : Gianyar, Karangasem, Badung, and Denpasar[3,4,5]. The highest incidence of taeniasis saginata was in Gianyar Regency and taeniasis solium in Karangasem Regency[6,7].

In rural areas of Sukawati including Guwang village, beef and pork "lawar" and roasted pig are consumed as local traditional food since long time ago as part of indigenous Balinese culture[8]. In survey of Puskesmas 1 Sukawati (Public Health Center) in 2016, 3 positive taeniasis cases found of 12 study subjects in Guwang Village[7]. This result was only survey from people who want for check of their stools. Purpose of the study was to known prevalence of taeniasis in Banjar Buluh, Guwang Village and determine risk factors or the relationship between meat consumption and individual characteristics with taeniasis.

## 2 Method

Observational cross sectional study with purposive random sampling was applied in this study. This study was done in May-July 2017. Samples were selected according to the inclusion and exclusion criteria. Inclusion criteria (people at Guwang village) : people consumed meat beef or pork, no previous treatment for taeniasis at least 6 months before the study, The exclusion criteria included children under 1 year old. About 30 grams of fecal samples was collected, 10% formalin was used for preservative. Normal saline was used for direct method. Light microscope and optilab were used to identify the taenia egg. Risk factors of taeniasis were identified using questionnaire. Descriptive analysis was used to explain risk factors (the meat consumption and individual characteristics) which contribute to occurrence of taeniasis.

## 3 Results And Discussion

**Table 1.** Taeniasis in Banjar Buluh, Guwang Village

Fecal Sample	Number	Percentage
Positive	2	1.8
Negative	108	98.2
Total	110	100.0

Table 1 shows prevalence of taeniasis in Banjar Buluh, Guwang Village, two subjects (1.8%) were positive for taenia egg both by direct smear methods

**Table 2.** Individual Characteristics Taeniasis egg positive subjects in Banjar Buluh, Guwang Village

Individual Characteristics	Positive		Negative	
	n	%	N	%
<b>1. Gender</b>				
a. Male	1	0.9	54	49.1
b. Female	1	0.9	54	49.1
Total	2	1.8	108	98.2
<b>2. Age (Years)</b>				
a. 1-10	0	0.0	2	1.8
b. 11-20	0	0.0	27	24.6
c. -30	0	0.0	20	18.2
d. 31-40	2	1.8	34	30.9
e. 41-50	0	0.0	15	13.6
f. 51-60	0	0.0	10	9.1
g. >60	0	0.0	0	0.0
Total	2	1.8	108	98.2
<b>3. Education level</b>				
a. No school	0	0.0	0	0.0
b. Elementary school	1	0.9	12	10.9
c. Junior High School	0	0.0	15	13.6
d. Senior High School	1	0.9	54	49.1
e. Graduate/ Postgraduate	0	0.0	27	24.6
Total	2	1.8	108	98.2

Individual Characteristics	Positive		Negative	
	n	%	N	%
4. Occupation				
a. No job	1	0.9	9	8.2
b. Farmer	0	0.0	10	9.1
c. Business	0	0.0	12	10.9
d. Village staff	0	0.0	10	9.1
e. Civil Servant	0	0.0	17	15.4
f. Seller	1	0.9	40	36.4
g. Student	0	0.0	10	9.1
Total	2	1.8	108	98.2

Table 2 shows prevalence of taeniasis (egg *Taenia* sp. was positive) as much as in male and female (male 50%, female 50%, age both 31-40 years old, the education level elementary school and senior high school and the occupation of subject seller and no job)

**Table 3.** Characteristics of meat consumption among *Taenia* egg positive subjects in Banjar Buluh, Guwang Village

Risk factors	Positive		Negative	
	n	%	n	%
1. Meat				
a. Pork	0	0.0	0	0.0
b. Beef	0	0.0	0	0.0
c. Pork and Beef	2	1.8	108	98.2
Total	2	1.8	108	98.2
2. Cooking Methods				
a. Raw	0	0.0	0	0.0
b. Undercooked	2	1.8	108	98.2
c. Cooked	0	0.0	0.0	0.0
Total	2	1.8	108	98.2
3. Frequency raw or undercooked meat (times/week)				
a. No consumption	0	0.0	0	0.0
b. >1	2	1.8	108	98.2
Total	2	1.8	108	98.2
4. Methods of obtaining meat				
a. Personal slaughtering	0	0.0	0	0.0
b. Market or Slaughterhouse	2	1.8	108	98.2
Total	2	1.8	108	98.2

The relationship between meat consumption (the type of meat consumed, meat processing methods, frequency of consumption, how to obtain meat) with taeniasis both positive subject meat consumption beef and pork, undercooked meat processing methods, frequency of consumption 1x/week and obtain to meat from market/slaughterhouse.

Taeniasis in this study was found in people in Banjar Buluh, Guwang village, 2 positive taeniasis cases found of 110 study subjects. This is one of the study's weaknesses or limitations. This result was influenced by the willingness of the study subjects to collect stool,

the time factor, and the respondents' local customs and belief, and the fact of taking the fecal samples to a distant laboratory for examination[10,11,12]. In this study the methods used for fecal examination were only direct method with Lugol. It is difficult to distinguish between *T. solium* / *T. saginata* / *T. asiatica*[13]. The two subjects with positive taenia eggs microscopically did not present proglottid so could not determine whether the cases were of taeniasis solium or taeniasis saginata or taeniasis asiatica. Both taeniasis positive samples showed that the direct method with Lugol still good used for fecal examination[2].

Local people's habit of eating food with undercooked pork or beef cannot be removed because it is hereditary and closely related to traditional and ritual ceremonies[14]. Balinese Hindu people including those in Banjar Buluh, Guwang village not only eat pork but also beef. A great segment of Hindu Balinese do eat beef, but according to the religion beef is not allowed for offerings and during religious events[13]. This fact is similar to that in the population of the village Ketewel, Gianyar, who predominantly consume beef lawar. It is clear that people's habit is difficult to change but if the pork or beef consumed is closely observed for cysticercus larvae and meat processing was done properly, then taeniasis cases can be minimized and the transmission source of cysticercosis can also be reduced in the community[13,14,15].

#### 4 Conclusions

Proportion of taeniasis among the people in Buluh, Guwang Village was 1.8 %. The type of meat consumed, meat processing methods, frequency of consumption, ways of obtaining meat and individual characteristics which may contribute to the taeniasis infection could not be evaluated due to limited number of positive cases.

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