

Cysticercosis/*T. solium* taeniasis, a Potential Public Health Concern in Non-endemic Country, Kuwait: A New Diagnostic Method to Screen *T. solium* Taeniasis carriers

Among the Expatriate Population

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Background:
The State of Kuwait is non-endemic for *Taenia solium* infection however, several cases of cysticercosis were detected among Kuwaiti nationals with no history of travel to endemic countries. The likely source of infection was suspected to be the infected expatriates from endemic countries working as domestic helpers/food handlers who may have escaped detection as taeniasis-carriers during initial screening of their stool samples by microscopy at the time of their entry into Kuwait.

Aims:
The objective of this study was to detect taeniasis-carriers among the newly arriving domestic helpers and food handlers in Kuwait by using a sensitive taeniasis-specific rES33 antigen assay.

Methods:
Newly arriving domestic helpers (n=500) and food handlers (n=500) from endemic countries were enrolled and their socio-demographic information was collected during 2015-2017. Stool samples were processed for microscopy and blood samples were used to detect anti-*T. solium* taeniasis-specific IgG antibodies by using taeniasis-specific rES33 antigen by ELISA as described. Positive & negative controls were used to determine the cut-off value for an ELISA positive serum sample. *T. solium*-specific rES33 antigen was expressed and purified from human embryonic kidney (HEK) 293-6E cells using the pTT5 mammalian expression vector.

Results:
All 1000 stool samples were negative for *Taenia* parasite gravid proglottids/eggs by microscopy. However, 42 individuals (4.2%) tested positive for *T. solium* taeniasis-specific IgG antibodies. Interestingly, all the three subjects with history of passing parasite segments in stool, subcutaneous swelling and/or abdominal discomfort were strongly positive for the presence of anti-*T. solium* taeniasis IgG antibodies. Though statistically not significant, the IgG seropositivity was higher among individuals with lower education levels, low-income background, and higher frequency of hand washing. The maximum number of seropositive subjects were from the Philippines (n=24) followed by India (n=12), Sri Lanka (n=3), Ethiopia (n=2) and Zimbabwe (n=1) as shown in the Table.

	No. of participants	No. of seropositive participants (%)	No. of seropositive participants by OD range		
			>1.20	>2.00	>3.00
Philippines	578	24 (4.2%)	13	7	2
India	276	12 (4.3%)	7	4	1
Sri Lanka	67	3 (4.5%)	2	0	1
Zimbabwe	10	1 (10.00%)	1	0	0
Ethiopia*	12	2 (16.7%)*	1	0	1
Nepal	33	0	-	-	-
Ghana	14	0	-	-	-
Others#	10	0	-	-	-

Table: Table showing participant distribution, percent seropositivity and OD range by nationality. *Indicates statistical significance ($P<0.05$)
Others (Cameroon 2, Togo 2, Uganda 2, Cote D'Ivoire 1, Gambia 1, Malawi 1, Senegal 1)00

Discussion:
This is the first report from Middle East on detection of anti-*T. solium* taeniasis-specific IgG antibodies among the high-risk expatriate population by using a highly sensitive ELISA using rES33 antigen. Our data may explain the source of infection in series of cysticercosis cases detected previously among the Kuwaiti nationals who had never consumed pork or travelled to an endemic country. The findings also have public health implications as more sensitive and efficient screening of food handlers and domestic helpers by ELISA may detect potential taeniasis carriers in Kuwait who could be appropriately treated to prevent the transmission of infection to the local population.

Conclusion:
These findings have public health implications as food handlers and domestic helpers who handle the food at commercial and residential facilities, respectively, could potentially transmit the infection to the local Kuwaiti nationals by feco-oral route by contaminating the food/water and thus may be responsible for causing cysticercosis in the infected individuals.

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