Short communication

Knowledge, attitude, and behavior of students regarding ‘mad cow disease’

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Abstract

The aim of the current study is to assess the knowledge, attitude and behavior of students enrolled at the American University of Beirut (AUB) in Lebanon, towards mad cow disease (MCD). Three hundred and fifty-six students (199 males and 157 females), ranging in age between 17 and 25 years were randomly selected from various majors and were asked to fill out a self-administered questionnaire. It was found that 99.7% of students had heard about MCD and 85.8% knew that the cow is the host for bovine spongiform encephalopathy (BSE). Seventy five percent reported that animals contract the disease through the consumption of meat and bone meal. Thirty-seven percent wrongly believed that MCD cases were reported in Lebanon and 89% were not satisfied with the measures undertaken by the Lebanese government to curb the disease. Eighty four percent were concerned about the disease and 72% stated having modified their eating habits accordingly. Moreover, students majoring in biology and other health-related majors knew significantly more about MCD compared with students majoring in non-health related majors. A surprising finding was that females were more likely to modify their eating habits than males. Hence, this study provides an insight into the knowledge, attitude, and behavior of AUB students towards MCD. A limitation of this study is that our sample is not representative of all university students in Lebanon. Future surveys should also target students enrolled in other universities in the country.

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1. Introduction

Bovine spongiform encephalopathy (BSE), commonly known as ‘mad cow disease’ (MCD), is a progressive lethal neurological disorder of cattle. It belongs to a class of prion diseases known as subacute spongiform encephalopathies. These diseases are characterized by the spongy appearance of the brain and include six animal diseases: scrapie of sheep and goats; mink and feline encephalopathy; wasting disease of deer and elk; in addition to human diseases, which include Kuru, Creutzfeldt–Jacob Disease (CJD) and two inherited diseases, Gerstmann–Straussler–Scheinker syndrome and fatal familial insomnia (White et al., 1994; Tyler, 2000; Carlini et al., 2001; Prusiner et al., 2001).

The first case of BSE in cattle was recognized in the UK in 1986. Affected cattle displayed changes in temperament such as aggression and nervousness, abnormal posture, difficulty in walking and weight loss. The incubation period of the disease ranges from 2 to 8 years and the animal usually dies within a few weeks to several months following the onset of symptoms (Prusiner et al., 2001).

Scientists speculated that the bovine agent originated from the scrapie agent that was present in sheep in the UK for more than 200 years. The scrapie agent is thought to have ‘jumped’ species and passed into cattle after they were fed Meat and Bone Meal (MBM) derived from contaminated sheep offal (Johnson, 1985; Institute of Food Technologies, 1996; Collee et al., 1997; Magnan, 1997; Brown, 2001; Brown et al., 2001).

BSE has also been reported principally in many European countries in addition to other non-European countries including the Falkland Islands, Canada, and Oman (Institute of Food Technologies, 1996; Brown et al., 2001).

Few weeks after the identification of the first case of BSE, concerns were raised about the risk of its transmission to humans (Brown et al., 2001). A human form of BSE termed new variant CJD (nvCJD), in contradistinction to the conventional form of CJD, was first identified in the UK in 1995 with more cases diagnosed during the years that followed (Tyler, 2000). It is believed that humans may have acquired nvCJD, a rare and fatal human neuro-degenerative condition, as a result of their consumption of beef products contaminated by central nervous tissue (Tyler, 2000; Brown, 2001; Carlini et al., 2001; Prusiner et al., 2001). New variant Creutzfeldt–Jacob disease occurs in younger individuals (average age 29 years as compared to 65 years in CJD) and has a relatively longer duration of illness (median 14 months as compared to 4.5 months) (Will et al., 1996; Tyler, 2000; WHO, 2000; Brown et al., 2001; Carlini et al., 2001).

So far, there has been less than 100 deaths from nvCJD worldwide and no cases of BSE or nvCJD have been officially reported in Lebanon (Johnson, 1985).

One study carried out on the general population of Geneva regarding changes in the dietary habits following the BSE crisis, and including 1190 men and 1154 women, revealed a spontaneous change in food habits especially among women (Morabia et al., 1999). Besides this study, no published reports were found in the literature dealing with the same or similar subject.

The aim of this study is to assess the knowledge, attitude, and behavior (KAB) of students enrolled at the American University of Beirut (AUB) regarding MCD and nvCJD, and to analyze the various factors that influence behavioral changes.

2. Material and methods

2.1. Subjects

The study surveyed students at the American University of Beirut (AUB), a private university with a student body of approximately 5000 students situated in the capital city of Beirut in Lebanon. The university serves as a leader in higher education and accommodates the cultural and religious diversity in the country and the Middle East region at large. AUB students are a selective group and cannot be considered to represent all university students in Lebanon; it is commonly believed that the tuition fee at this private university is one of the highest among universities in the country and hence, that AUB
students tend generally to have a higher socio-economic status.

This study was conducted on 356 AUB students from the various faculties of the university. Two or three of the class sessions in each faculty were randomly chosen and at the end of each session, a self-administered multiple-choice questionnaire was distributed to those students who accepted to participate.

2.2. Questionnaire

The study questionnaire consisted of four pages, divided into three sections. The first section asked for information about the personal profile of the participant. The second section assessed the students’ level of knowledge about MCD, while the third section inquired about the students’ concern regarding MCD, and its impact on the students’ eating habits.

2.3. Data coding

Each question in the survey was coded and entered as a separate variable using the statistical software SPSS 10. Students were divided into two categories according to their major: (1) biology and health-related majors (chemistry, medical lab., environmental health, medicine, and nursing); and (2) non-health related majors (business, computer science, engineering, public administration/political science, English literature, and architecture).

2.4. Statistical analysis

Data were analyzed using SPSS 10. General frequencies were conducted on the questions included in the survey. Age, gender, and majors were taken as independent variables, while the rest were considered as dependent ones. Chi-square analysis was conducted and the attitude and behavior were cross-tabulated against a number of variables. A $P$-value of $<0.05$ was considered significant.

3. Results

Among the 356 students sampled, 157 were females (44%) and 199 were males (56%). The mean age of students in the sample was 20 years and 223 students (63%) were below 21 years of age. One hundred and twenty-five students (36%) were in biology and health-related majors. Sophomore students formed the majority of the sample (44.7%) followed by seniors (28.4%), juniors (12.9%), graduates including medical students (11.0%), and others (3.1%) (includes freshman and senior engineering students).

The overwhelming majority of the student sample (99.7%) had heard about MCD. Eighty-six identified the cow as the host of MCD and 81% attributed meat, innards, gelatin, cosmetics or a combination of those as being the most likely item(s) responsible for the transmission of the disease. Furthermore, 75% recognized that animal feed containing offals is responsible for the infection of the animal, and 65% stated that the disease latency period in cows is more than five years. In addition, 47% of students identified the correct symptoms of the disease, 40% knew that prion is the causative agent, 24% knew that once diagnosed, the disease results in animal death within months. Twenty-two percent believed that the underlying causative agent can be destroyed, out of those only 5% identified the correct procedure (temperature $>400^\circ$C and/or temperature $>120^\circ$C $+ \text{NaOH}$). Twenty-one percent knew that up to the current date less than 100 cases of nvCJD have been reported worldwide. Only 12% knew that MCD is diagnosed by post-mortem biopsy (Table 1). A majority of responders (63%) stated that they had not heard of any reported cases of MCD in Lebanon.

Although as yet, we do not have definite answers regarding transmission of the disease among humans and the occurrence of nvCJD cases in Lebanon, 50% expressed their belief that transmission of the nvCJD among humans is not possible while 19% believed it was possible, and 31% did not know.

Further analysis revealed that age and gender did not have much impact on the students’ level of knowledge. With respect to gender, a significant difference was found regarding the existence of reported MCD cases in Lebanon and the possibility of transmission of the disease among humans. Although comparable number of males (30%) and
females (33%) did not express any definite answer, more males (27%) than females (9%) believed that human to human transmission is possible \( (P < 0.001). \) In addition, more females (45%) than males (31%) have heard about the occurrence of MCD cases in Lebanon \( (P = 0.014). \)

The impact of students’ major on their level of knowledge was also tested. The responses of students in biology and health-related majors differed significantly from those in non-health related majors on a number of questions. These included: the mode of transmission of disease in animals \( (P = 0.038), \) latency period in animals \( (P = 0.008), \) diagnostic method \( (P = 0.008), \) etiology \( (P = 0.000), \) and symptoms of the disease \( (P = 0.000). \)

As expected, a higher percentage of biology and related majors responded correctly to the above questions compared to non-biology majors.

As far as attitude and behavior of students following MCD crisis are concerned, 84% expressed concern about it, and, 91% felt that they needed to know more about the disease. Sixty seven percent believed that the Lebanese government was not taking enough precautions to curb the spread of the disease in Lebanon, while 11% considered governmental measures as satisfactory and 22% answered that they did not know (Table 3).

Seventy-two percent of students modified their eating habits following recent media attention to MCD cases out of whom 40% avoided all kinds of red meat and 55% reported that they avoided only beef and beef products. Furthermore, 82% of students who felt that government measures were unsatisfactory modified their eating habits (data not shown).

Although choice of major had an impact on the students’ level of knowledge about MCD, it did not affect the attitude and behavior of students regarding this disease. In fact, 89% of those who believed there were MCD cases in Lebanon were concerned as compared to 81% of their counterpart (Table 3). Moreover, age had no significant effect on the students’ attitude and behavior to MCD.

On the other hand, when considering students’ behavior following the MCD crisis, females were more likely to modify their eating habits than males (83% vs. 64%, \( P < 0.001) \) (data not shown).

The attitude and behavior of the students regarding MCD affected whether they desired to further their knowledge about the disease. Those who were concerned about the disease and those who modified their eating habits were more likely to feel that they need to enhance their information about the disease (data not shown).

### Table 1
Assessment of students’ level of knowledge towards MCD

<table>
<thead>
<tr>
<th>Questions about MCD</th>
<th>No. of students</th>
<th>Valid correct answers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting correct answers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>303</td>
<td>86</td>
</tr>
<tr>
<td>Means of transmissions to humans</td>
<td>285</td>
<td>81</td>
</tr>
<tr>
<td>Way animals contract disease</td>
<td>262</td>
<td>75</td>
</tr>
<tr>
<td>Latency period</td>
<td>220</td>
<td>65</td>
</tr>
<tr>
<td>Symptoms</td>
<td>161</td>
<td>47</td>
</tr>
<tr>
<td>Cause</td>
<td>139</td>
<td>40</td>
</tr>
<tr>
<td>Fatality</td>
<td>82</td>
<td>24</td>
</tr>
<tr>
<td>Possibility of inactivating prions</td>
<td>75</td>
<td>22</td>
</tr>
<tr>
<td>Mechanism of inactivating prions</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Reported number of world cases</td>
<td>63</td>
<td>21</td>
</tr>
<tr>
<td>Mode of diagnosis</td>
<td>40</td>
<td>12</td>
</tr>
</tbody>
</table>

### Table 2
Assessment of students’ attitude and behavior towards MCD

<table>
<thead>
<tr>
<th>Attitude and behavior</th>
<th>No. of students</th>
<th>Valid percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerned about the disease</td>
<td>292</td>
<td>84</td>
</tr>
<tr>
<td>Satisfied with government measures</td>
<td>36</td>
<td>11</td>
</tr>
<tr>
<td>Would like to know more about BSE</td>
<td>314</td>
<td>91</td>
</tr>
<tr>
<td>Modified their eating habits</td>
<td>251</td>
<td>72</td>
</tr>
</tbody>
</table>

### Table 3
Factors affecting students’ attitude towards MCD

<table>
<thead>
<tr>
<th>Factor vs. attitude</th>
<th>Concerned (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases in Lebanon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heard about</td>
<td>89.1</td>
<td>0.049</td>
</tr>
<tr>
<td>Not heard about</td>
<td>80.6</td>
<td>0.049</td>
</tr>
<tr>
<td>Reaction towards government measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>60.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Not satisfied</td>
<td>90.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Don’t know</td>
<td>74.0</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
4. Discussion

Despite the fact that MCD has only recently been recognized, it has nevertheless received a wide coverage in the media and the community worldwide. This study revealed that students at AUB have good basic information about MCD as revealed by the high percentages of correct answers to basic questions such as: the host of the disease, mode and agent of transmission. However, as questions became more specific, less students were able to respond correctly. For example, fewer than 50% knew the symptoms of the disease, 24% stated that prions are the cause of the disease, and only 12% knew how MCD is diagnosed.

On the other hand, it was interesting to note that only 21.4% of the students stated that the cases of nvCJD reported worldwide were less than 100. Such information is common and usually disseminated to people through the media. Given the extensive publicity and coverage about the disease, one is likely to believe that its prevalence rate is much higher than what it actually is. Hence, it is not surprising that most of students (84%) were concerned about the disease and 72% modified their eating habits accordingly. Despite the fact that the Lebanese government has made substantial efforts in taking appropriate measures to curb the spread of the disease, the majority of students (89%) considered those measures as unsatisfactory.

Age was found not to have any influence on student level of knowledge. This could be explained by the narrow age range of our sample.

Biology and health-related major students had a better knowledge about the disease. In fact, students with biology and health-related majors were more likely to respond correctly to questions such as cause, symptoms, latency period, and mode of diagnosis than students with no biological background. This is because the media does not usually cover such specific information about the above questions, which are likely to be covered in biology courses.

Gender had a significant impact on the behavior of students and females were more likely to modify their eating habits than males. These findings compare favorably with what had been reported in the Swiss population-based study on people’s dietary habits before and after the MCD crisis by Morabia et al. (1999). A possible explanation could be that more females than males believed that there are MCD cases in Lebanon and consequently, they were more inclined to modify their eating behavior. Another possible explanation might be that females in general, worry more about their health status than males as was documented in the Swiss population-based study (Morabia et al., 1999).

5. Conclusion

This study, being the first to investigate knowledge, attitude, and behavior concerning MCD among university students, sheds light on the students’ level of knowledge and concern towards MCD. Moreover, it unveils some of the factors that affect one’s level of knowledge and concern.

Having been carried out on a group of students selected from one university, this study has some limitations. Firstly, it is not representative of all university students in Lebanon and secondly, since the survey questionnaire was self-administered it may have resulted in students misinterpreting some of its questions.

Future studies should thus be carried out with students enrolled in other universities in the country, and should also assess the possible nutritional consequences on individuals as a result of abstaining from eating red meat.

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