J. Biosoc. Sci., (2010) **42**, 161–176, © Cambridge University Press, 2009
doi:10.1017/S0021932009990472 First published online 19 Nov 2009

EFFECTS OF A FORMAL TRAINING PROGRAMME ON CONSANGUINEOUS MARRIAGES ON HIGH SCHOOL STUDENTS' KNOWLEDGE AND ATTITUDES: AN INTERVENTIONAL STUDY FROM TURKEY

AHMET NESIMI KISIOGLU*, AHMET RIFAT ORMECI†, ERSIN USKUN*, MUSTAFA OZTURK* AND KURTULUS ONGEL‡

**Department of Public Health, Faculty of Medicine, Süleyman Demirel University, Isparta, Turkey, †Department of Pediatrics, Faculty of Medicine, Suleyman Demirel University, Isparta, Turkey and ‡Department of Family Medicine, Faculty of Medicine, Süleyman Demirel University, Isparta, Turkey*

Summary. Consanguineous marriage is traditionally common throughout the eastern Mediterranean region. Research has suggested that it is closely linked to the sociocultural and socioeconomical status of individuals, and education plays a critical role in decreasing the number of cases. This study aimed to determine the effects of a formal training programme on consanguineous marriages on the knowledge of, and attitudes towards, consanguineous marriage of high school students (n=804) in the Mediterranean region of Turkey. Seniors from three randomly selected public high schools participated in the pre-test and post-test design study. To determine the effects of the programme, students who received the training were compared with those who did not receive any formal training about the subject. After the post-tests were administered, data were collected and analysed using chi-squared and McNemar tests. The results showed significant differences in knowledge and attitudes among the students who had received the formal training programme and those who had not. In addition, the results indicated potential peer influence between the students who received training in consanguineous marriage and those who did not.

Introduction

Even though consanguineous marriages can be encountered in any culture, they are often associated with developing countries and cultures that hold certain religious values. The World Health Organization (WHO) has reported that consanguineous marriage is traditionally common throughout the eastern Mediterranean region (Gunaid *et al.*, 2004). Research in this area strongly supports that prevalence of

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

consanguineous marriages is strongly linked to socioeconomic and sociocultural status. Health problems caused by consanguineous marriage and the economical burdens they bring are the main concerns for many countries. Among many of the potential health problems of a high prevalence of consanguineous marriage are significantly increased risk for some genetic diseases, cancer, mental disorders, heart diseases, gastrointestinal disorders, hypertension and hearing deficit (Editorial, 1991; Bener *et al*., 2007).

Although, for Turkey, the percentage of first and second degree consanguineous marriages among all marriages is 20.92%, there are differences among regions. The occurrence increases to 32.86% for the eastern region of Turkey, and decreases to 10.18% for first and second degree consanguineous marriages of all marriages in the western region (Ulusoy & Tunçbilek, 1987) and 25.6% in central Anatolia (Hancıoğlu & Tunçbilek, 1998).

In addition, due to the effects of different factors, variations can be seen between cities in the same region. The consanguineous marriage rates for Isparta and neighbouring Antalya, which receives migration from the east of Turkey, were reported as 16.8% and 35.2%, respectively (Güz *et al*., 1989; Kisioglu *et al*., 2005).

Preventive measures in the form of genetic counselling or educational programmes have been reported to be the most effective approaches to reducing the number of health problems, from autosomal recessive hereditary diseases to hearing impairment (Zakzouk, 2002; Meyer, 2005). Meyer (2005), however, points out that these programmes are most successful when they are sensitive to the cultural backgrounds of populations in which they are implemented. Furthermore, the form of education and the age it is offered are the other key concerns that need to be taken into account in order to increase the success of these programmes. Since marriage decisions are being made as early as the teenage years, it would be most effective to provide teenagers with formal educational programmes about consanguineous marriage. In some countries, this has been achieved by incorporating preventive medicine into the science curriculum throughout schooling (National Research Council, 1996). Parallel with these current global developments in education, Turkey is undergoing major changes in its educational system as well (Erdal & Ongel, 2003). These developments are affecting both the structure and the curriculum. Therefore, in this study, the purpose was twofold. The primary purpose was to investigate the effects of a formal training programme on high school students' knowledge about consanguineous marriage and their attitudes toward the issue. The secondary purpose was to investigate peer interaction about consanguineous marriage among those students who had received the training and those who had not, in order to provide better feedback on the curriculum development efforts.

Methods

The study was conducted during the final term at three randomly selected high schools (HS-1, HS-2, HS-3) in Isparta, a city located in the Mediterranean region of Turkey. A questionnaire was given to all the students, both before and after the training programme. The education process was planned for all of the students in HS-1, half of the students in HS-2 and none of the students in HS-3.

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

According to the school government office data, a total of 907 students were recorded. The student number before and after the training period was 804 and analyses were progressed for these 804 students. In order to determine the effects of the training programme, a pre-test/post-test design was used.

The research was carried out over a 5-month period from January to May 2007. All the students in HS-1 (n=164), HS-2 (n=294) and HS-3 (n=346) were administered a questionnaire. Students were asked 37 questions. Seven questions were descriptive questions (name, gender, school name, classroom, school number) in order to recognize the student after 5 months. Fifteen questions were about socio-demographical features of the students and their families (birth place, educational status, job, monthly income, number of siblings, consanguinity). Fifteen were designed to measure students' knowledge of consanguineous marriage and their attitudes towards the issue. Later, the schools were randomly assigned to receive a training programme related to consanguineous marriage. The training included a 45 minute presentation and helpful handouts about the subject prepared by two medical doctors who were specialized in public health education. The presentation was then followed by a 30 minute discussion session in order to improve the effectiveness of the programme.

A consanguineous marriage was defined as the union of two people related as second cousins or closer (Bittles, 2001).

After a 5-month period, post-tests were administered to all groups. Data were analysed using the statistical package for social sciences SPSS 11.0. Differences between the groups were assessed by chi-squared and McNemar analysis and an α-level of 0.05 was used for all statistical tests.

Even though it was stated that students were allowed to leave questions unanswered if they wished, all of the questions except the one about 'family income' were answered completely. This outcome can be related to the fact that the study was performed in classrooms, and that students in Turkey tend to be well disciplined. Also, students stated orally that giving no answer to the 'family income' question was linked to the irregular income of their families. Most were tradesmen or farmers and had no regular income; moreover, they tend to consume their own products.

Results

The descriptive features of the study group based on high school are presented in Table 1. Analysis of the pre-tests revealed no statistical differences in the socio-demographic features (Table 1), and knowledge and attitudes about consanguineous marriage and thalassaemia (Table 2) (p>0.05) among the participants who attended the three high schools.

Comparison of the three high schools on students' knowledge and attitudes about consanguineous marriage in the post-test period, however, showed statistically significant differences among the three schools (Table 2). The percentage of students who knew about thalassaemia differed by high school, being significantly higher in students from HS-1 and HS-2 than those from HS-3. Compared with students who attended HS-2 and HS-3, those who attended HS-1 were also more aware of the fact that thalassaemia is a hereditary disease. The percentage of students who knew that

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 1. Distribution of the characteristics of the study group by school

		HS-1		HS-2		HS-3		Total		
		n	%	*n*	%	*n*	%	*n*	%	p^a
Consanguineous marriage education	Education offered	164	100.0	162	55.1	0	0	326	40.5	<0.001
	No education	0	0	132	44.9	346	100.0	478	59.5	
Gender	Male	73	44.5	131	44.6	155	44.8	359	44.7	0.997
	Female	91	55.5	163	55.4	191	55.2	445	55.3	
Year of birth	1986	9	5.5	11	3.7	8	2.3	28	3.5	0.160
	1987	41	25.0	48	16.3	71	20.5	160	19.9	
	1988	106	64.6	222	75.5	252	72.8	580	72.1	
	1989	8	4.9	13	4.4	15	4.3	36	4.5	
Living status of parents	Both alive	155	94.5	285	96.9	328	94.8	768	95.5	0.434
	Mother alive	9	5.5	8	2.7	14	4.0	31	3.9	
	Father alive			1	0.3	2	0.6	3	0.4	
	Both dead					2	0.6	2	0.2	
Education status of father	Not educated	3	1.8	3	1.0	1	0.3	7	0.9	0.471
	Literate	1	0.6	4	1.4	5	1.4	10	1.2	
	Primary school	53	32.3	110	37.4	104	30.1	267	33.2	
	Secondary school	30	18.3	55	18.7	63	18.2	148	18.4	
	High school	45	27.4	75	25.5	98	28.3	218	27.1	
	University	32	19.5	47	16.0	75	21.7	154	19.2	
Education status of mother	Not educated	6	3.7	13	4.4	7	2.0	26	3.2	0.248
	Literate	7	4.3	17	5.8	9	2.6	33	4.1	
	Primary school	87	53.0	166	56.5	181	52.3	434	54.0	
	Secondary school	24	14.6	43	14.6	55	15.9	122	15.2	
	High school	31	18.9	43	14.6	72	20.8	146	18.2	
	University	9	5.5	12	4.1	22	6.4	43	5.3	

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 1. *Continued*

		HS-1		HS-2		HS-3		Total		
		n	%	*n*	%	*n*	%	*n*	%	p^a
Father's job	Not working	12	7.3	17	5.8	21	6.1	50	6.2	0.528
	Working class	31	18.9	63	21.4	53	15.3	147	18.3	
	Official	47	28.7	74	25.2	103	29.8	224	27.9	
	Tradesman	47	28.7	100	34.0	111	32.1	258	32.1	
	Retired	27	16.5	39	13.3	58	16.8	124	15.4	
	Other			1	0.3			1	0.1	
Mother's job	Housewife	143	87.2	249	84.7	300	86.7	692	86.1	0.402
	Working class	4	2.4	11	3.7	4	1.2	19	2.4	
	Official	10	6.1	16	5.4	21	6.1	47	5.8	
	Tradesman	3	1.8	8	2.7	4	1.2	15	1.9	
	Retired	4	2.4	9	3.1	13	3.8	26	3.2	
	Not filled in			1	0.3	4	1.2	5	0.6	
Number of siblings	0	6	3.7	8	2.7	14	4.0	28	3.5	0.178
	1	69	42.1	109	37.1	160	46.2	338	42.0	
	2	57	34.8	101	34.4	115	33.2	273	34.0	
	3	25	15.2	44	15.0	39	11.3	108	13.4	
	4	5	3.0	14	4.8	8	2.3	27	3.4	
	5 or more	2	0.6	18	5.1	10	2.9	30	3.7	
Frequency of meeting with family members	Never			3	1.0			3	0.4	0.170
	Always	142	86.6	239	81.3	286	82.7	667	83.0	
	Once a week	11	6.7	19	6.5	28	8.1	58	7.2	
	Once a month	9	5.5	16	5.4	18	5.2	43	5.3	
	Other	2	1.2	17	5.8	14	4.0	33	4.1	
Family income	Very high	15	9.1	26	8.8	36	10.4	77	9.6	0.474
	High	36	22.0	87	29.6	101	29.2	224	27.9	
	Mean	73	44.5	123	41.8	147	42.5	343	42.7	
	Low	40	24.4	58	19.7	62	17.9	160	19.9	

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 1. *Continued*

		HS-1		HS-2		HS-3		Total		
		n	%	*n*	%	*n*	%	*n*	%	*p*[a]
Living place	With family	142	86.6	235	79.9	290	83.8	667	83.0	0.571
	Student house	3	1.8	11	3.7	8	2.3	22	2.7	
	Student dormitory	17	10.4	39	13.3	39	11.3	95	11.8	
	Other	2	1.2	9	3.1	9	2.6	20	2.5	
Year lost during high school	Yes	7	4.3	18	6.1	16	4.6	41	5.1	0.597
	No	157	95.7	276	93.9	330	95.4	763	94.9	
Consanguinity between mother and father	Yes	37	22.6	66	22.4	67	19.4	170	21.1	0.561
	No	127	77.4	228	77.6	279	80.6	634	78.9	
Degree of consanguinity	Paternal aunt–maternal uncle	10	6.1	7	2.4	11	3.2	28	3.5	0.161
	Paternal uncle's children	8	4.9	17	5.8	13	3.8	38	4.7	
	Maternal aunt's children	3	1.8	17	5.8	10	2.9	30	3.7	
	Second degree relative	16	9.8	25	8.5	33	9.5	74	9.2	
	No relation	127	77.4	228	77.6	279	80.6	634	78.9	
Disease in the family related to consanguinity	Yes	3	1.8	16	5.4	12	3.5	31	3.9	0.338
	No	97	59.1	163	55.4	206	59.5	466	58.0	
	No idea	64	39.0	115	39.1	128	37.0	307	38.2	
Having thalassaemic consanguine	Yes	18	11.0	29	9.9	52	15.0	99	12.3	0.118
	No	146	89.0	265	90.1	294	85.0	705	87.7	
Total		164	100.0	294	100.0	346	100.0	804	100.0	

[a]Chi-squared; evaluation of descriptive features for all three schools.

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 2. Percentage distribution of the knowledge and attitude of students before and after the education periods

		HS-1 N=164	HS-2 N=294	HS-3 N=346	Total N=804	p^a	p^b
Do you know about thalassaemia?							
Before education	Yes	45.7	50.3	52.6	50.4	0.350	0.344
	No	54.3	49.7	47.4	49.6		
After education	Yes	91.5	85.0	56.4	74.0	<0.001	0.047
	No	8.5	15.0	43.6	26.0		
What kind of disease is thalassaemia?							
Before education	Contagious	4.9	5.1	6.1	5.5	0.778	0.717
	Hereditary	40.2	36.4	40.2	38.8		
	Have no idea	54.9	58.5	53.8	55.7		
After education	Contagious	7.3	3.4	7.2	5.8	<0.001	0.011
	Hereditary	90.2	88.4	42.2	68.9		
	Have no idea	2.4	8.2	50.6	25.2		
How is it transmitted?							
Before education	By microbes	12.8	9.9	9.2	10.2	0.215	0.704
	By heredity	39.0	38.4	46.5	42.0		
	By not washing hands	1.2	2.0	0.6	1.2		
	Have no idea	47.0	49.7	43.6	46.5		
After education	By microbes	1.8	8.8	6.1	6.2	<0.001	0.008
	Hereditary	96.3	87.1	51.2	73.5		
	By not washing hands	0.0	1.4	0.9	0.9		
	Have no idea	1.8	2.7	41.9	19.4		
Do you know about the tests before marriage?							
Before education	Yes	59.1	57.1	61.0	59.2	0.242	0.422
	No	3.0	5.8	7.2	5.8		
	Heard but does not have enough knowledge	37.8	37.1	31.8	35.0		

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 2. *Continued*

		HS-1 N=164	HS-2 N=294	HS-3 N=346	Total N=804	p^a	p^b
After education	Yes	97.6	84.7	63.9	78.4	<0.001	<0.001
	No	1.2	4.1	7.5	5.0		
	Have no idea	1.2	11.2	28.6	16.7		
How can you protect yourself?							
Before education	By hand washing	6.7	3.4	3.2	4.0	0.233	0.312
	By protecting ourselves from diseases	3.0	5.1	4.6	4.5		
	By tests before marriage	46.3	46.3	52.9	49.1		
	Have no idea	43.9	45.2	39.3	42.4		
After education	By hand washing	3.0	11.2	3.2	6.1	<0.001	<0.001
	By protecting ourselves from diseases	2.4	3.1	4.6	3.6		
	By tests before marriage	94.5	79.6	53.5	71.4		
	Have no idea	0.0	6.1	38.7	18.9		
Can carrier have a normal life?							
Before education	Yes	50.0	49.0	52.0	50.5	0.408	0.413
	No	13.4	9.9	13.3	12.1		
	Have no idea	36.6	41.2	34.7	37.4		
After education	Yes	81.1	64.3	52.3	62.6	<0.001	<0.001
	No	3.7	9.5	13.6	10.1		
	Have no idea	15.2	26.2	34.1	27.4		
How can it be diagnosed?							
Before education	By physical examination	4.9	5.4	2.6	4.1	0.158	0.866
	By blood examination	49.4	44.9	48.8	47.5		
	By urine examination	2.4	3.4	0.9	2.1		
	Diagnosis can't be certain	1.8	1.4	3.2	2.2		
	Have no idea	41.5	44.9	44.5	44.0		

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 2. *Continued*

		HS-1 N=164	HS-2 N=294	HS-3 N=346	Total N=804	p^a	p^b
After education	By physical examination	1.2	5.1	2.6	3.2	<0.001	0.006
	By blood examination	84.8	69.4	60.7	68.8		
	By urine examination	0.6	2.0	0.9	1.2		
	Diagnosis can't be certain	0.0	0.3	3.5	1.6		
	Have no idea	13.4	23.1	32.4	25.1		
Would you consider consanguineous marriage for the future?							
Before education	Yes	16.5	13.9	15.3	15.0	0.757	0.467
	No	83.5	86.1	84.7	85.0		
After education	Yes	6.1	8.5	15.3	10.9	0.002	0.353
	No	93.9	91.5	84.7	89.1		

[a]Chi-squared; evaluation of knowledge for all three high schools.
[b]Chi-squared; evaluation of knowledge for HS-1 and HS-2.

thalassaemia is transmitted to people through heredity differed by high school as well, and the students who attended HS-1 were more likely to know that the disease is hereditary. The students who attended HS-1 were more likely to be aware of the diagnostic tests that are conducted before marriage. They were also more aware that in order to prevent this disease, they need to take tests before marriage. The students who received the formal training programme were more likely to know that carriers can have a normal life, and that the disease can be diagnosed by blood tests. Furthermore, the proportion of students from HS-1 who would not consider consanguineous marriage for the future was 0.78, whereas this proportion from the control group was 0.57. The difference in proportions is significant at $p<0.001$.

Analysis of the post-test results showed statistical differences ($p<0.05$) between the students who attended HS-1 and HS-2 in all parameters except for the question 'Would you consider consanguineous marriage for the future?' (Table 2).

Table 3 shows the comparison of percentage distribution of knowledge and attitudes of students in HS-2 between pre-test and post-test periods. Analysis of Grp-A (the educated group) and Grp-B (the non-educated group) pre-tests showed that the two groups did not differ significantly in any of the parameters. However, in the post-test period there were differences between the groups in many parameters (Table 3). The percentage of students who knew about thalassaemia differed by group, being significantly higher for students in the educated group (Grp-A). The students in Grp-A were also aware that thalassaemia is a hereditary disease and there are diagnostic tests that are conducted before marriage. They also knew that the best way to prevent this disease is to take tests before marriage. Students in Grp-A knew that carriers can have a normal life, and that the disease can be diagnosed by blood tests.

Table 4 compares students' attitudes in Grp-A and Grp-B about consanguineous marriage between the pre-test and post-test periods. The results from the pre-test showed that although 16.6% of the students in Grp-A ($n=162$) were considering consanguineous marriage, 11.1% changed their minds after receiving the training ($p<0.05$). In Grp-B ($n=132$), although the percentage of students who were considering consanguineous marriage declined from 9.09% to 1.51%, the change was not statistically significant ($p=1.000$).

Discussion

The design of this study allowed not only a comparison of the effects of consanguineous marriage training through pre-test and post-test analysis, but also assessment of the degree of student interaction concerning the transfer of knowledge about consanguineous marriage.

The results of the study showed that the training provided at the three high schools was effective and positively influenced students' knowledge about, and attitudes towards, consanguineous marriage. While the pre-test comparisons showed no statistical differences in students' knowledge and attitudes, the post-test comparisons revealed statistical differences among the three schools (Table 2). Post-test, students who attended HS-1 were more knowledgable about consanguineous marriage

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 3. Percentage distribution of the knowledge of students in HS-2 before and after the education periods

		Before education			After education		
		A. Will be educated group	B. Will not be educated group	p^a	A. Educated group	B. Non-educated group	p^b
Have you heard of thalassaemia?	Yes	48.1	53.0	0.405	93.2	75.0	<0.001
	No	51.9	47.0		6.8	25.0	
What kind of disease is thalassaemia?	Contagious	7.4	2.3	0.137	5.6	0.8	0.072
	Hereditary	35.8	37.1		87.0	90.2	
	Have no idea	56.8	60.6		7.4	9.1	
How is it transmitted?	Contagious	8.0	12.1	0.069	9.9	7.6	0.023
	Hereditary	34.0	43.9		87.0	87.1	
	By not washing hands	3.1	0.8		2.5	0.0	
	Have no idea	54.9	43.2		0.6	5.3	
Do you know about the tests before marriage?	Yes	53.7	61.4	0.376	98.1	68.2	<0.001
	No	6.8	4.5		0.6	8.3	
	Heard but does not have enough knowledge	39.5	34.1		1.2	23.5	
How can you protect yourself?	By hand washing	3.1	3.8	0.953	1.2	23.5	<0.001
	By protecting ourselves from patients	5.6	4.5		1.2	5.3	
	By tests before marriage	46.9	45.5		97.5	57.6	
	Have no idea	44.4	46.2		0.0	13.6	
Can carrier have a normal life?	Yes	46.9	51.5	0.726	74.7	51.5	<0.001
	No	10.5	9.1		6.8	12.9	
	Have no idea	42.6	39.4		18.5	35.6	

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 3. *Continued*

		Before education			After education		
		A. Will be educated group	B. Will not be educated group	p^a	A. Educated group	B. Non-educated group	p^b
How can it be diagnosed?	By physical examination	4.3	6.8	0.540	1.9	9.1	<0.001
	By blood examination	42.0	48.5		84.6	50.8	
	By urine examination	3.7	3.0		0.0	4.5	
	Can't be diagnosed	1.9	0.8		0.0	0.8	
	Have no idea	48.1	40.9		13.6	34.8	
Would you consider consanguineous marriage for the future?	Yes	16.7	10.6	0.136	6.2	11.4	0.112
	No	83.3	89.4		93.8	88.6	
Total		162	132	294			
		100.0	100.0	100.0			

[a]Chi-squared; evaluation between groups that will be educated and those that will not before the education period.
[b]Chi-squared; evaluation between groups educated and not educated after the education period.

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Table 4. Comparision of students in HS-2 for the question 'Would you consider consanguineous marriage for the future?' before and after education, among educated and non-educated groups

		Response to question 'Would you consider consanguineous marriage for the future?' after education													
		A. Educated group							B. Non-educated group						
		Yes		No		Total			Yes		No		Total		
		n	%	*n*	%	*n*	%	p^a	*n*	%	*n*	%	*n*	%	p^b
Before education	Yes	9	5.55	18	11.1	27	16.6	<0.001	12	9.09	2	1.51	14	10.6	1.00
	No	1	6.17	134	82.7	135	83.3		3	15.15	115	87.12	118	89.4	
	Total	10		152		162	100.0		15		117		132	100.0	

[a]Evaluation of the educated group before and after education periods, McNemar test.
[b]Evaluation of the non-educated group before and after education periods, McNemar test.

than those who attended HS-2, and students who attended HS-2 were more knowledgable about the issue than students who attended HS-3.

Prior to the study it was hypothesized that there would be some degree of student interaction among the students who attended the same high school concerning the transfer of knowledge about consanguineous marriage. In order to examine this interaction the post-test results of students in HS-1 and HS-3, as well as the post-test results of students in HS-2 and HS-3, were compared. In both cases, pre-test results showed no statistical differences in any of the parameters; however, post-test results showed statistical differences in all parameters. This result indicates that even though only half of the students in HS-2 received training they were still significantly different in their knowledge and attitudes, like students in HS-1, from the students who did not receive any training. This finding supports the initial hypothesis that there is student interaction among high school students, even in subjects that are not commonly brought up in everyday conversations. It is concluded that this interaction could be beneficial in the training of students about consanguineous marriage; however, caution needs to be taken concerning the accuracy of information being transferred.

In order to determine the attitudes of students toward consanguineous marriage, students were asked the question 'Would you consider consanguineous marriage for the future?' Comparison of post-test results among high schools showed statistically significant differences (Table 2). The percentage of students who would consider consanguineous marriage in the future was significantly higher in HS-3 (15.3%) than in HS-1 (6.1%) and HS-2 (8.5%). Comparison of post-test results between HS-1 and HS-2 in this question, however, showed no statistical differences, which indicates that students not only influenced each others' knowledge but also their attitudes toward consanguineous marriage (Table 2).

Further analysis of HS-2 was also performed to understand better the attitude changes of students in the trained (Grp-A) and untrained (Grp-B) groups (Table 4). Contrary to expectations, no statistically significant differences were found between the pre-test and post-test periods on students' attitudes in Grp-B (Table 4). However, the number of students who would consider consanguineous marriage in the future in Grp-A decreased significantly between pre-test and post-test periods (Table 4). This finding indicates that student interaction was not as effective as receiving formal education in changing one's attitude about a subject. The former findings indicated that there has been a significant change in students' knowledge in Grp-B (Table 3); however, this change has not been transfered to student attitudes, yet (Table 4). The possible rationale for this result is embedded in the education literature. As described by Erdal *et al*. (2006), people's knowledge and self-belief in most cases are the foundations of their positive attitudes, which give rise to positive behaviour. Koballa & Crawley (1985) use the following example to describe this relationship in teacher education: 'Elementary school teachers judged their ability to teach science to be low (knowledge/belief), resulting in a dislike for science teaching (attitude) that ultimately translated into teachers who avoided teaching science (behaviour).' Considering the given example, it is expected that with continuing formal training, students might transfer their knowledge about consanguineous marriage into positive attitudes and behaviour in the future. However, in addition to the length of education, there might be some underlying influences that prevent them from changing their attitudes

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

towards consanguineous marriage, such as the influence of the family, which also need to be further explored.

Conclusion

As the trends indicate, consanguineous marriages and the medical complications associated with them have not decreased in the last decade in Turkey. Therefore, it is evident that more drastic measures need to be taken both in Turkey and around the world. As part of a holistic approach, the benefits of a formal training programme on the knowledge and attitudes of high school students in Isparta, Turkey, were explored. The results showed that receiving formal education about consanguineous marriage influenced students' knowledge about the subject, which potentially in the future will transfer into positive attitudes and behaviour.

The findings of this study also indicate the existance of peer interaction among students. This interaction was more effective, however, in the transfer of knowledge than in the influence behaviour changes. This could simply be attributed to the nature of attitude or behaviour change processes; or to the underlying influences in subjects' lives, other than their friends.

It is often observed that even though mandatory tests conducted right before marriage inform people about the risks, they have very little effect on changing peoples' decisions about having consanguineous marriages. Similarly, it is not effective to urge people not to get married after a transmitter gene is found in any or both of the partners. Furthermore, there are certain social or economical factors that would undermine the effectiveness of these tests in many countries.

Therefore, in order to decrease the number of medical cases related to consanguineous marriage, it is strongly suggested that educational programmes for younger adults, possibly as part of the mandatory curriculum in high schools, should include information about consanguineous marriages and the potential medical complications. In order for this education to be effective, it is recommended that these instructions be continuous and inclusive regardless of students' academic study areas (maths, social, etc.).

References

Bener, A., Hussain, R. & Teebi, A. S. (2007) Consanguineous marriages and their effects on common adult diseases: studies from an endogamous population. *Medical Principles and Practice* **16**(4), 262–267.

Bittles, A. (2001) Consanguinity and its relevance to clinical genetics. *Clinical Genetics* **60**(2), 89–98.

Editorial (1991) Consanguinity and health. *Lancet* **338**, 85–86.

Erdal, S. O. & Ongel, K. (2003) *Promoting Learner-Centered Instruction Through the Use of Cooperative and Inquiry Learning Strategies*. ERIC Document Reproduction Service ED 479308.

Erdal, S. O., Taskin, B. C. & Gunhan, C. B. (2006) Developing a self-efficacy scale towards the use of mathematics in teaching science: a validity and reliability study. *Mid-Western Educational Research Association Conference*, 11–14th October 2006, Columbus, OH, USA.

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press

Gunaid, A. A., Hummad, N. A. & Tamim, K. A. (2004) Consanguineous marriage in the capital city Sana'a, Yemen. *Journal of Biosocial Science* **36**(1), 111–121.

Güz, K., Dedeoğlu, N. & Lüleci, G. (1989) The frequency and medical effects of consanguineous marriages in Antalya, Turkey. *Hereditas* **111**(1), 79–83.

Hancıoğlu, A. & Tunçbilek, E. (1998) Consanguineous marriage, sociodemographic features and effects on child deaths. *Turkish Journal of Pediatrics* **41**, 139–153.

Kisioglu, A. N., Ozturk, M., Uskun, E. & Ormeci, A. R. (2005) Socio-demographic properties of consanguineous marriages in Isparta Province, Turkey. *Turkish Journal of Public Health* **3**(2), 80–83.

Koballa, T. R. & Crawley, F. E. (1985) The influence of attitude on science teaching and learning. *School Science and Mathematic* **85**, 222–232.

Meyer, B. F. (2005) Strategies for the prevention of hereditary diseases in a highly consanguineous population. *Annals of Human Biology* **32**(2), 174–179.

National Research Council (1996) *National Science Education Standards*. National Academies Press, Washington DC, USA.

Ulusoy, M. & Tunçbilek, E. (1987) Consanguineous marriage and the effects on child deaths in Turkey. *Turkish Journal of Population Studies* **9**(7), 26.

Zakzouk, S. (ed.) (2002) Consanguinity and hearing impairment in developing countries: a custom to be discouraged. *Journal of Laryngology and Otology* **116**, 811–816.

https://doi.org/10.1017/S0021932009990472 Published online by Cambridge University Press