



Video Teaching Leads to Improved Attitudes Towards Obesity—a Randomized Study with 949 Participants

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Published online: 5 March 2019

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Abstract

Background Obesity is a rising social and economic burden. Patients with obesity often suffer from stigmatization and discrimination. Underrecognition of obesity as a disease could be a contributing factor. The present study aimed to compare attitudes towards obesity with other chronic diseases and to evaluate the recognition of need of professional treatment.

Methods Nine hundred and forty-nine participants (subgroups: general population, patients with obesity, nurses in training, nurses, medical students, physicians) were randomized to video teaching on obesity and control. Questionnaires on the burden and influence of obesity on daily life compared to other chronic diseases and the fat phobia scale (FPS) were answered.

Results Burden of obesity was rated low (4.2 ± 1.3 ; rank 9 of 11) compared to other diseases. Bowel cancer (5.5 ± 0.9) had the highest and carries the lowest (2.7 ± 1.4) estimated impact. Females ($p = 0.011$) and older people ($p < 0.001$) rated burden of obesity high whereas general population ($p < 0.001$) and control ($p < 0.001$) rated it low. Females ($p = 0.001$) and people with higher BMI ($p = 0.004$) rated the influence of obesity on daily life high; the general population ($p < 0.001$; reference physicians) and the control group ($p < 0.001$) rated it low. FPS was lowest in patients with obesity (3.2 ± 0.7) and highest in the general population (3.6 ± 0.4) and medical students (3.6 ± 0.5 ; $p < 0.001$; compared to physicians).

Conclusions Obesity is underestimated as a disease compared to other chronic diseases and attitudes towards obesity are rather negative in comparison. Video teaching showed positive effects so a focus in medical education and public campaigns should aim to improve prevention and treatment of obesity.

Keywords Obesity · Stigmatization · Burden of disease · Chronic diseases · Discrimination · Fat phobia scale

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Introduction

Due to rising prevalence, morbid obesity is socio-economically relevant [1, 2]. The American Medical Association recognized obesity as a disease as early as 2013 [3]. Morbidity and mortality of obesity are dependent on severity and are comparable to other chronic and malignant diseases [4]. Studies showed that morbidity significantly increases with $\text{BMI} \geq 25 \text{ kg/m}^2$ and mortality significantly increases with $\text{BMI} \geq 27 \text{ kg/m}^2$ [5, 6]. Calle et al. reported that individuals with a $\text{BMI} > 40 \text{ kg/m}^2$ had a relative mortality of 2.6 compared to those with a BMI between 22.0 and 24.9 kg/m^2 [7]. Nevertheless, obesity is often considered a lifestyle disease that the affected are made responsible for (“their own fault”, “should eat less”) [8]. Obese individuals are often discriminated, stigmatized, and associated with negative character traits due to their weight. In addition to the physical burden of obesity itself, this can negatively affect mental and physical health of those individuals [9]. A refusal attitude with high “fat phobia” was reported in the general population, but also in (future) medical professionals [10, 11].

Despite the high prevalence, physicians only report obesity in some of the patients, indicating that impact and need for professional treatment are rather underestimated [12, 13]. While patients with diabetes mellitus, arterial hypertension, tumors, or trauma naturally receive the appropriate medical treatment, patients with obesity must obtain special approval procedures in order for insurance to cover interventions to treat obesity in many countries including the authors’ home country Germany. In contrast, the evidence for obesity surgery and metabolic surgery is demonstrably an effective and sustainable form of therapy [14]. In addition to weight loss, surgical interventions can also improve obesity-related comorbidities such as diabetes mellitus, arterial hypertension, and fatty liver disease [15–20], as well as quality of life [21–23]. Nonetheless, patients often have to go through a long and arduous journey including conservative treatment options and requesting coverage before insurance companies are willing to pay for surgical interventions if these are covered at all [24].

The present study aimed to investigate the perceived burden of obesity in comparison to other chronic diseases in various medical and non-medical groups, as well as to evaluate the stigmatization of obesity. In addition, the influence of an educational video with neutral information on obesity was investigated.

Material and Methods

The present study examined six different groups that responded to self-developed questionnaires and the validated fat phobia scale (FPS) between August 2016 and July 2017: general population, patients with obesity, nurses in training, certified nurses, medical students, and physicians. The

participants were recruited in public places (general population), in an obesity outpatient clinic (patients with obesity), in nursing schools (nurses in training), during medical lectures at the University of Heidelberg (medical students), and at congresses, training courses, and in hospitals (physicians and nurses) in Heidelberg and Baden-Baden, Germany.

The questionnaires consisted of five individual questions and the FPS in abbreviated form [25]. The five individual questions were about burden of the disease, impact on personal relationships, working life, self-responsibility, and the need for professional treatment of obesity and other chronic and common diseases (diseases are listed in Fig. 1). Each category was rated on a six-point scale (1 point = very low impact, 6 points = very high impact). Furthermore, demographic data (age, weight, height, educational status, illnesses) were queried. In addition to the evaluation of the individual questions, the average of the questions on the influence on personal relationships, working life, and the need for professional therapy was considered as an “influence on daily life”. In prior studies, fat phobia was defined as a pathological fear of extreme obesity, which is associated with stereotypes and a negative attitude towards individuals with obesity [26]. The FPS is a validated questionnaire that measures the view on obesity by interrogating potential obesity characteristics. Each individual question is scored with one point (very positive, e.g., diligent) to five points (very negative, e.g., lazy) [25]. The mean value of the answers to the questions gives the value for the FPS.

Intervention

In order to provide neutral information on obesity and related treatment, the intervention group was shown a two-and-a-half-minute animated video (produced with “GoAnimate”, San Mateo, USA) before answering the questionnaires (physician informs a patient with obesity about potential risks, side effects, and possible treatments for obesity).

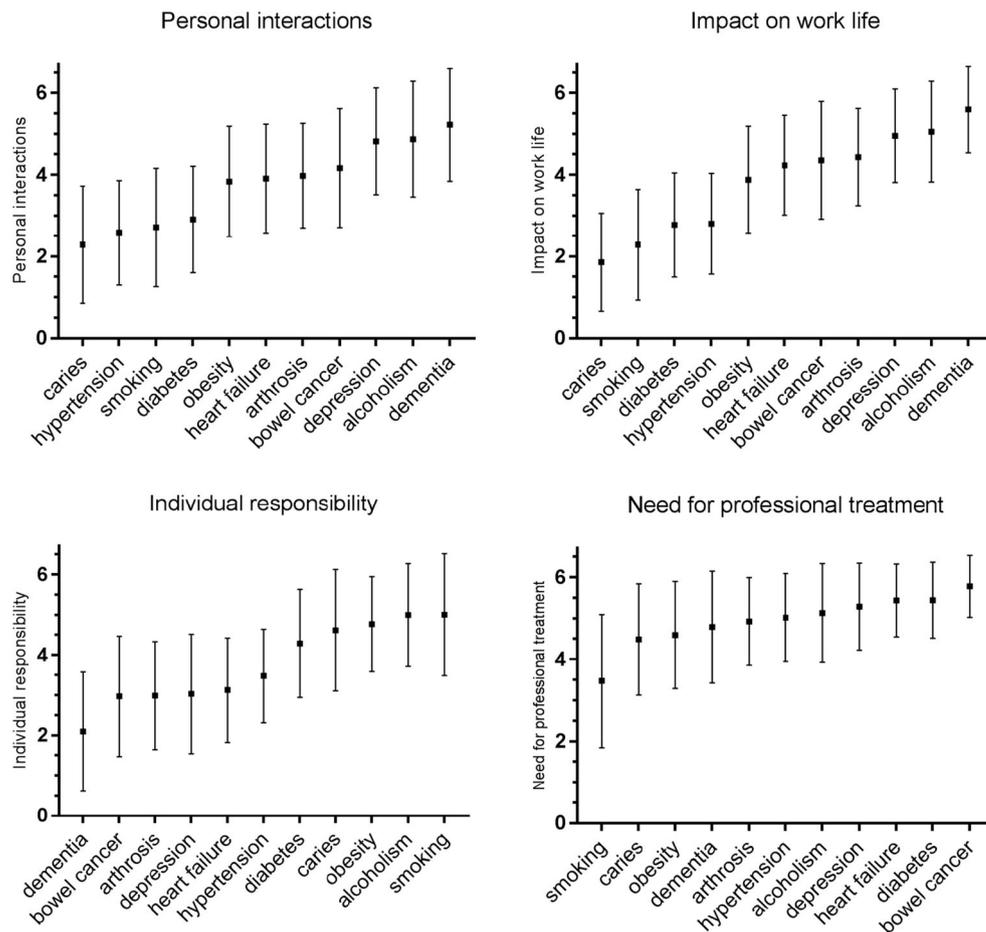
Randomization

The stratified randomization to intervention and control group was carried out as individual randomization (general population, nurses, physicians) and cluster randomization (medical students, nurses in training). Patients with obesity were not randomized because they were already informed about the condition in detail through their own experience and regular visits at the obesity clinic.

Statistical Analyses

The characteristics of the study population and the individual questions were presented separately for the intervention and control groups as well as for the individual subgroups by mean and standard deviation or absolute and relative frequencies.

Fig. 1 Scored by all participants: influence* of chronic diseases on personal interactions, work life, individual responsibility, and need for professional treatment from lowest score (left) to highest score (right). Presented as mean \pm standard deviation. *1 = very low influence, 6 = very high influence



Questionnaire responses were compared by Mann-Whitney *U* tests between control and intervention groups. The different subgroups were compared using Kruskal-Wallis tests. Using a linear regression model, the influence of BMI, age, sex, patients with obesity within friends/family, subgroup, and intervention on responses was examined. Since this was an exploratory study, *p* values were interpreted exclusively descriptively. For all statistical analysis, R (version 3.2.3) was used [27].

Results

Nine hundred and forty-nine people participated in the study (159 from the general population, 82 patients with obesity, 150 nurses, 202 nurses in training, 208 medical students, 148 physicians). The participants within the subgroups were comparable in terms of age, gender, BMI, presence of friends/family with obesity, and comorbidities (Table 1).

Burden of Chronic Diseases

The burden of obesity (4.2 ± 1.3) was rated low compared to other chronic diseases (rank 9 of 11). Of the total population, bowel cancer was rated highest (5.5 ± 0.9) and caries (2.7 ± 1.4)

lowest. Linear regression analyses showed that female ($p = 0.011$) and older participants ($p < 0.001$) rated the burden of obesity higher, while the general population ($p < 0.001$, compared to physicians) and the control group ($p < 0.001$) rated it lower (Table 3). The burden of various chronic diseases and their influence on different areas of daily life are presented in Table 2 and Fig. 1. The influence of obesity on work life was rated significantly higher in the intervention groups of nurses (4.4 ± 1.2 vs. 3.8 ± 1.3 , $p = 0.007$) and medical students (3.9 ± 1.2 vs. 3.5 ± 1.2 , $p = 0.009$) compared to the respective control groups. In the intervention group of medical students (4.6 ± 1.2 vs. 4.2 ± 1.1 , $p = 0.005$) and physicians (5.0 ± 1.2 vs. 4.6 ± 1.2 , $p = 0.028$), the need for professional treatment was rated significantly higher than in the associated control groups. In addition, the intervention group of physicians (4.2 ± 1.2 vs. 3.7 ± 1.4 ; $p = 0.037$) assessed the impact of obesity on personal relations higher than the respective control group. There were no significant differences in the other subgroups studied. Individual responsibility for obesity (4.8 ± 1.2 , rank 3) was rated rather high in comparison to the diseases with the lowest (dementia: 2.1 ± 1.5) and the highest ratings (smoking: 5.1 ± 1.5 , Fig. 1).

Linear regression analyses with the dependent variable “Influence of obesity on daily life” showed that participants

Table 1 General information of the study population

Parameter*	Intervention group	Control group	Total
General population, <i>n</i>	78	81	159
Age (years)	35.1 ± 12.8	33.3 ± 13.9	34.2 ± 13.3
BMI (kg/m ²)	23.5 ± 3.6	23.4 ± 3.4	23.5 ± 3.5
Sex, female	43 (56.6%)	46 (57.5%)	89 (57.1%)
Obesity within friends/family	36 (46.8%)	32 (40.5%)	68 (43.6%)
Patients with obesity, <i>n</i>	–	82	–
Age (years)		45.9 ± 13.6	
BMI (kg/m ²)		39.1 ± 11.9	
Sex, female		51 (64.6%)	
Obesity within friends/family		46 (59%)	
Nursing in training, <i>n</i>	113	89	202
Age (years)	22.0 ± 3.9	22.2 ± 2.6	22.1 ± 3.4
BMI (kg/m ²)	22.4 ± 3.6	23.3 ± 4.1	22.8 ± 3.8
Sex, female	91 (82.0%)	75 (85.2%)	166 (83.4%)
Obesity within friends/family	59 (52.2%)	45 (52.3%)	104 (52.3%)
Nurses, <i>n</i>	72	78	150
Age (years)	34.9 ± 11.5	35.7 ± 12.2	35.3 ± 11.9
BMI (kg/m ²)	24.6 ± 5.9	25.2 ± 5.2	24.9 ± 5.6
Sex, female	52 (76.5%)	57 (77.0%)	109 (76.8%)
Obesity within friends/family	29 (43.3%)	42 (59.2%)	71 (51.4%)
Medical students, <i>n</i>	132	76	208
Age (years)	22.2 ± 2.3	22.7 ± 2.8	22.4 ± 2.5
BMI (kg/m ²)	22 ± 2.5	21.7 ± 2.4	21.9 ± 2.5
Sex, female	66 (50.8%)	37 (50.0%)	103 (50.5%)
Obesity within friends/family	59 (45.4%)	34 (45.3%)	93 (45.4%)
Physicians, <i>n</i>	64	84	148
Age (years)	39.5 ± 13.4	38.6 ± 10.9	39 ± 12
BMI (kg/m ²)	23.5 ± 3.5	23.5 ± 3.8	23.5 ± 3.6
Sex, female	27 (42.9%)	43 (51.8%)	70 (47.9%)
Obesity within friends/family	28 (46.7%)	39 (50.0%)	67 (48.6%)
Total, <i>n</i>	459	490	949
Age (years)	28.7 ± 11.4	33.0 ± 13.4	30.9 ± 12.7
BMI (kg/m ²)	23.0 ± 3.9	26.0 ± 8.4	24.5 ± 6.8
Sex, female	279 (62.3%)	309 (64.4%)	588 (63.5%)
Obesity within friends/family	211 (47.2%)	238 (51.0%)	449 (49.1%)

*Presented as mean ± standard deviation or number (percent)

n number, *BMI* body mass index

with higher BMI and female gender rated the influence of obesity on daily life higher (Table 3). Participants from the general population as well as from the control group rated the influence of obesity on daily life and burden of obesity lower than physicians or participants from the intervention group. Other parameters showed no significant influence.

Fat Phobia Scale

There were no significant differences in the FPS between the control group and the intervention group as a whole ($p =$

0.108) and between the control and intervention groups of the individual subgroups (Table 4). There were significant differences between the different subgroups in the control group with the lowest FPS in patients with obesity (3.2 ± 0.7) and the highest FPS in the general population (3.6 ± 0.4) and medical students (3.6 ± 0.5 , $p < 0.001$).

There were also significant differences between the different subgroups of the intervention group, with the lowest FPS among nurses (3.3 ± 0.7) and the highest FPS among medical students (3.7 ± 0.5 , $p < 0.001$). Participants with obesity found patients with obesity to be more diligent (2.7 ± 0.9 vs. $3.5 \pm$

Table 2 Burden of common chronic diseases

Disease with ranking	Burden of disease									
	Total	C	I	<i>p</i> value C vs. I ^a	P	N	MS	NT	O	GP
1. Bowel cancer	5.5 ± 0.9	5.5 ± 1.0	5.5 ± 0.9	0.984	5.4 ± 0.9	5.3 ± 1.1	5.7 ± 0.7	5.3 ± 1.0	5.3 ± 1.3	5.7 ± 1.6
2. Dementia	5.2 ± 1.2	5.1 ± 1.2	5.2 ± 1.1	0.645	5.3 ± 1.1	5.0 ± 1.2	5.4 ± 0.9	5.0 ± 1.1	5.1 ± 1.4	5.1 ± 1.3
3. Depression	5.1 ± 1.1	5.0 ± 1.2	5.1 ± 1.1	0.909	5.1 ± 1.0	5.0 ± 1.3	5.3 ± 0.8	4.8 ± 1.2	5.1 ± 1.4	5.0 ± 1.2
4. Heart failure	5.0 ± 1.0	5.0 ± 1.1	4.9 ± 1.0	0.300	5.1 ± 1.0	5.0 ± 1.0	5.1 ± 0.9	4.9 ± 1.1	5.0 ± 1.2	4.6 ± 1.1
5. Alcoholism	4.7 ± 1.3	4.7 ± 1.3	4.7 ± 1.3	0.381	5.1 ± 1.0	4.7 ± 1.3	4.8 ± 1.1	4.5 ± 1.3	4.8 ± 1.5	4.3 ± 1.5
6. Arthrosis	4.5 ± 1.1	4.5 ± 1.2	4.5 ± 1.1	0.726	4.4 ± 1.1	4.6 ± 1.2	4.7 ± 1.0	4.4 ± 1.0	4.9 ± 1.2	4.3 ± 1.2
7. Diabetes	4.4 ± 1.2	4.3 ± 1.3	4.4 ± 1.2	0.659	4.8 ± 1.1	4.5 ± 1.3	4.1 ± 1.2	4.1 ± 1.2	4.6 ± 1.4	4.4 ± 1.2
8. Hypertension	4.3 ± 1.2	4.3 ± 1.2	4.3 ± 1.2	0.725	4.5 ± 1.2	4.5 ± 1.2	4.1 ± 1.2	4.2 ± 1.2	4.5 ± 1.2	4.1 ± 1.2
9. Obesity	4.2 ± 1.3	4.2 ± 1.3	4.3 ± 1.2	0.118	4.5 ± 1.1	4.5 ± 1.3	4.1 ± 1.2	4.1 ± 1.3	4.9 ± 1.1	3.8 ± 1.3
10. Smoking	3.1 ± 1.6	3.1 ± 1.5	3.2 ± 1.6	0.418	3.5 ± 1.5	3.4 ± 1.7	3.1 ± 1.4	2.9 ± 1.6	3.1 ± 1.6	2.8 ± 1.6
11. Caries	2.7 ± 1.4	2.7 ± 1.4	2.7 ± 1.4	0.893	3.1 ± 1.4	3.1 ± 1.5	2.7 ± 1.4	2.5 ± 1.3	2.7 ± 1.4	2.4 ± 1.4

C control group, I intervention group, P physicians, N nurses, MS medical students, NT nurses in training, O patients with obesity, GP general population

^a Mann-Whitney *U* test

0.6) and more attractive (3.1 ± 1.0 vs. 3.8 ± 0.7) compared to medical students ($p < 0.001$ for comparison between subgroups). In 12 of 14 questions (85.7%) on the FPS, patients with obesity showed the lowest score (most positive) whereas medical students and the general population showed the highest score (the most negative). In a linear regression analysis with the dependent variable “FPS” (Table 3), patients with higher BMI, older age, female gender, with friends/family that have obesity as well as nurses and nurses in training showed a lower FPS (more positive). The intervention showed no influence on the FPS.

Discussion

The present study shows that the burden of obesity is considered to be low compared to common chronic diseases such as bowel cancer, diabetes mellitus, or arterial hypertension. This contrasts with the high impact on daily life and health of affected individuals as well as socioeconomic impact in general. An intervention through video teaching with neutral information on obesity had positive effects. The control group without intervention and the general population rated the burden of obesity lower, whereas female and elderly persons rated it higher.

In the present study, burden of obesity was considered to be low compared to other chronic diseases such as colon cancer, diabetes mellitus, or arterial hypertension (rank 9 out of 11). Participants who received a video teaching on obesity rated the burden higher than the control group (in subgroups of nurses, medical students, and physicians). The impact of obesity on daily life and the need for professional treatment were considered to be high in all groups studied. Similar to the burden of

obesity, the control group and the general population rated the influence of obesity on daily life as lower, whereas females and those with higher BMI rated the influence higher. The intervention groups of medical students and physicians rated the need for professional treatment higher than respective control groups. This shows that the awareness of obesity as a disease in need of professional treatment can be increased by access to neutral information even among medical professionals. Approaches for potential improvement could include a higher focus on obesity as a disease in medical education as well as in postgraduate education. With regard to the FPS, all groups showed high (negative) values. Medical students and the general population showed the most negative attitude in 85.7% of FPS questions. Puhl et al. reported that patients with obesity are often stigmatized and held responsible for their weight themselves. They therefore recommended campaigns that reduce stigma in order to increase willingness of physicians and insurance companies to treat obesity [9]. Zhang et al. showed that obesity is often associated with low social status, which itself can lead to stigmatization and can be exacerbated by obesity or vice versa [28]. In the present study, most groups considered obesity to have a high negative impact on daily life and that it requires professional treatment. Furthermore, females and participants with higher BMI rated the influence of obesity on daily life rather high, whereas the control group and the general population rated the influence lower. In addition, individuals' responsibility for obesity was rated high compared to other chronic diseases. This underlines that access to educational information may increase the sensitivity to obesity as a serious disease. However, these should be effective, as the present study shows that the burden of diabetes and smoking is considered low, although recent major education campaigns

Table 3 Linear regression analyses with predictors for the influence of obesity on daily life, the burden of obesity, and scoring of the fat phobia scale

	Influence of obesity on daily life		Burden obesity		Fat Phobia Scale	
	Predictor (standard error)	<i>p</i> value*	Predictor (standard error)	<i>p</i> value*	Predictor (standard error)	<i>p</i> value*
(Intercept)	3.592 (0.23)	< 0.001	3.716 (0.288)	< 0.001	4.12 (0.126)	< 0.001
BMI	0.02 (0.007)	0.004	0.007 (0.007)	0.411	−0.012 (0.004)	0.002
Age	0.006 (0.004)	0.073	0.017 (0.004)	< 0.001	−0.006 (0.002)	0.003
Sex (Ref.: male)						
Female	0.243 (0.072)	0.001	0.229 (0.09)	0.011	−0.087 (0.04)	0.029
Obesity within family/friends	−0.066 (0.067)	0.324	0.046 (0.084)	0.585	−0.122 (0.037)	0.001
Group (Ref.: Physicians)						
General population	−0.463 (0.117)	< 0.001	−0.601 (0.146)	< 0.001	0.068 (0.064)	0.291
Patients with obesity	0.104 (0.179)	0.561	0.274 (0.225)	0.225	−0.063 (0.099)	0.529
Nurses in training	−0.197 (0.126)	0.118	−0.301 (0.157)	0.056	−0.142 (0.069)	0.041
Nurses	−0.066 (0.123)	0.591	−0.053 (0.154)	0.73	−0.207 (0.068)	0.002
Medical students	−0.112 (0.123)	0.362	−0.173 (0.154)	0.261	0.021 (0.068)	0.752
Intervention (Ref.: yes)						
No	−0.274 (0.07)	< 0.001	−0.316 (0.087)	< 0.001	−0.006 (0.038)	0.875

The numbers in italics is the statistical significance

BMI body mass index

Example: The predictor describes the change of the questions regarding the influence of obesity on daily life per unit of the influencing variable: e.g., women rated the influence of obesity on daily life 0.243 higher and people from the general population 0.463 less than physicians, a 1-year older person rated the influence of obesity on daily life 0.006 higher

*Wald test

have been conducted on these two topics [29]. In the present study, patients with obesity themselves rated the impact of obesity on daily life highest in four out of five questions, indicating a decreased quality of life. However, it has also been shown that obesity surgery improves quality of life and body image [21, 22, 30].

The developers of the short form of FPS, Bacon et al. defined low scores as “rather low fat phobia” and high scores as “rather high fat phobia” [25]. In a study of 1657 participants, Stein et al. defined values < 2.5 as rather positive or neutral and values ≥ 2.5 as rather negative [31]. In the present study, all groups had a rather negative attitude towards obesity (mean FPS: 3.5 ± 0.6). In particular, medical students and the general population showed high (negative) scores and had the most negative scores in 12 out of 14 individual questions. This is consistent with a study by Soto et al. with Mexican medical and psychology students. They reported an overall negative attitude towards obesity (mean FPS: 3.4 ± 0.5), with only 2% of participants having a positive or neutral attitude [32]. Berryman et al. reported even higher FPS (meaning more negative attitude) among students of nutritional science (mean FPS: 3.7 ± 0.7) [33]. A similar assessment was made by the present study with people from the general population and medical students with the most negative attitude towards obesity. Carels et al. reported that a high degree of stigmatization

of people with obesity can lead to higher consumption of food, less exercise, and less weight loss after diets resulting in a vicious circle [34]. Therefore, it would be useful to counteract this stigma through education and information. Participants who had a higher BMI themselves or reported obesity within friends/family showed a lower score in the FPS. Other authors have recommended that the provision of neutral information on obesity and education about the burden of this disease should be given higher priority [35]. This is confirmed by results of the present study and shows the need for recognition of obesity as a serious disease and the need for information and campaigns on prevention and treatment options.

The importance of professional treatment for obesity was recently highlighted in a study by the NCD Risk Factor Collaboration, which studied 126 million children, adolescents, and adults between 1975 and 2016 [36]. A general, age-adjusted increase in the prevalence of obesity from 0.9% in 1975 to 7.8% in 2016 in both children and young adults was reported. It was estimated that by the year 2022, the number of overweight children and adolescents will exceed that of underweight children and adolescents worldwide for the first time. This underlines the great impact of obesity on the healthcare system and the enormous challenge it brings. Jung et al. have also shown that referring physicians often have prejudices against obesity and often do not consider surgical interventions,

Table 4 Fat Phobia Scale, intervention vs. control group

Parameter	Intervention group	Control group	<i>p</i> value ^a
Total, <i>n</i>	457	489	0.108
M ± SD	3.5 ± 0.6	3.5 ± 0.6	
Median (q1, q3)	3.5 (3.1; 3.9)	3.4 (3.1; 3.9)	
General population, <i>n</i>	78	79	0.692
M ± SD	3.6 ± 0.5	3.6 ± 0.4	
Median (q1, q3)	3.6 (3.2; 3.9)	3.6 (3.3; 3.9)	
Patients with obesity, <i>n</i>	–	78	–
M ± SD		3.2 ± 0.7	
Median (q1, q3)		3.2 (2.9; 3.6)	
Nurses, <i>n</i>	71	77	0.754
M ± SD	3.3 ± 0.7	3.3 ± 0.7	
Median (q1, q3)	3.3 (3.0; 3.7)	3.4 (2.9; 3.8)	
Nurses in training, <i>n</i>	113	89	0.749
M ± SD	3.4 ± 0.6	3.4 ± 0.6	
Median (q1, q3)	3.5 (3.1; 3.8)	3.4 (3.1; 3.7)	
Medical students, <i>n</i>	131	74	0.267
M ± SD	3.7 ± 0.5	3.6 ± 0.5	
Median (q1, q3)	3.7 (3.4; 4.0)	3.6 (3.4; 4.0)	
Physicians, <i>n</i>	64	83	0.309
M ± SD	3.5 ± 0.5	3.5 ± 0.5	
Median (q1, q3)	3.5 (3.1; 3.8)	3.6 (3.2; 3.9)	
<i>p</i> values (comparison of subgroups) ^b	<0.001	<0.001	

n number, *M* ± *SD* mean ± standard deviation, *q1* first quartile, *q3* third quartile

^a Mann-Whitney *U* test

^b Kruskal-Wallis test

even if there is an indication, as they consider this intervention to be “too simple” for the patient [37]. The present study shows that there is generally a rather negative attitude towards obesity. Although all groups see a need for professional treatment, the affected individuals are primarily held responsible themselves. Notably, even patients with obesity themselves reported a high need for professional treatment. The structured treatment of obesity by conservative multimodal programs as well as obesity surgery and metabolic surgery cannot only reduce weight sustainably, but also obesity-related diseases [16, 17, 20] and quality of life [21, 22, 38]. Of course, it would be preferable to have more education, campaigns, and interventions that lead to optimized nutrition to avoid obesity as a whole. The Royal College of Physicians in the United Kingdom also recently advised the government to recognize obesity as a disease, because otherwise the prevalence would not be reduced [39]. Furthermore, classifying and recognizing obesity as a chronic disease could allow general healthcare policies to be implemented to improve primary and secondary care for patients with obesity.

Limitations

Since obesity is already part of the training in medical professions, the information shown in the video was not new to all participants in the intervention group. In addition, only a limited amount of information was shown in the two-and-a-half-minute video. Nonetheless, this video was supposed to sensitize participants to problems and potential side effects that may be associated with obesity. A longer and more detailed video sequence with possible interactions could have an even bigger effect on answering the questions. In addition, some (6.4%) of the participants did not respond or did not complete the FPS entirely. Given the fact that the questionnaires in the present study were self-developed (except the FPS), comparison with studies that used different questionnaires or tools may be misleading and biased by the nature of the study designs. However, even though using other tools of assessing the attitude towards obesity, numerous studies demonstrated an overall negative picture of obesity in different populations.

Conclusions

The burden of obesity is considered to be low compared to other chronic diseases. Furthermore, results of the present study suggest that individuals with obesity were associated with rather negative characteristics. Not only the general population, but also nurses in training, nurses, medical students, and physicians seem to have negative prejudices against obesity. Overall, the professional need for treatment for obesity was rated high, and the medical students' and physicians' intervention groups each had a higher score than their control groups. Some of the subgroups with intervention by video teaching rated the burden of obesity higher than the respective control groups. This shows the existing need for more information and education on obesity in both the general population and in medical professions. One consequence of this should be to teach obesity more intensively for medical professionals and to sensitize both the general public, health care providers, and insurance companies to the impact on daily life and the need for effective and professional prevention and therapy. Improving prevention and treatment quality of obesity, reducing stigma, and recognizing obesity as a disease should be the major goals of campaigns.

Acknowledgements We would like to thank the study program “Interprofessional Health Care” of the Academy of Health Professions at the University of Heidelberg for their support in designing and conducting the study. We furthermore thank Mr. Berend Schlüter of the Nursing School at the Hospital Mittelbaden for his support in conducting the study. We thank Danny Tran for proofreading of the manuscript.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Statement of Informed Consent Informed consent was obtained from all individual participants included in the present study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was obtained from the local ethics committee (S-381/2016).

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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