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Body Mass Index and Quality of Life in Patients Waiting for Coronary Angiography

A Pilot Study

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Abstract

Aim: There is evidence that the body mass index (BMI) is related, to some extent, to the quality of life (QoL) in different populations. The purpose of our study was to investigate the differences in QoL in relation to the BMI in patients awaiting coronary angiography.
Method: The sample consisted of 100 patients (68 males and 32 females) with symptoms indicating coronary angiography. For all of them BMI was calculated. The participants completed the Duke Health profile questionnaire (DUKE) which measures adult self-reported functional health status.
Results: After splitting the group in two according to the BMI median cut-off point, the findings reveal differences in the following aspects of QoL secondary to BMI: mental health (p = .006), general health (p = .038), perceived health (p = .008), anxiety (p = .022), depression (p = .008), anxiety-depression (p = .004), but not related to: physical health (p = .384), social health (p = .267), self-esteem (p = .172), pain (p = .797), disability (p = .710).
Conclusion: Considering the findings, health counselling directed at regulating body weight is recommended as part of the positive health behaviour. It can benefit and improve some domains of the QoL of individuals having health problems.

Keywords: body mass index, quality of life, coronary angiography, health counselling, positive health behaviour

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Introduction

The characterization of obesity as a "pandemic" – a term once thought of as applying only to infectious diseases – reflects the apparent spread of obesity both within and across countries. Obesity has become a societal problem of populations, not merely of individuals, and has spread to children as well as adults in populations globally. Obesity considerations now include elements that extend far beyond the clinical domain. The reasons for such trends of increased obesity are environmental factors such as globalization, economic changes, and urbanization. These have changed the types and quantities of food available and the typical levels of physical activity, the result being chronic positive energy balance, and increases in average body weights (Kumanyika, Rigby, Lobstein,

Leach, & James, 2010). In the Practical Manual of Clinical Obesity, authors Kushner, Lawrence, and Kumar (2013) say the following:

> The health risks of excess weight have been demonstrated in multiple population studies. Obesity significantly increases a person's risk of developing numerous non-communicable diseases (NCDs), including cardiovascular disease, cancer, diabetes, sleep disturbance, and other disabilities. The risk of developing more than one of these diseases (co-morbidity) also increases with increasing body weight. Accordingly, obesity-related healthcare costs are soaring and contribute to an increasing percentage of total healthcare expenditures. These data suggest that halting and reversing the obesity epidemic will require involvement of multiple stakeholders, including the medical profession (p. vii).

Once considered a problem only in high income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings – states the World Health Organization (World Health Organization [WHO], 2013a)

Body Mass Index

The body mass index (BMI) is a calculation of a person's weight compared to his or her height. It is calculated by taking a person's weight (in kilograms) divided by the person's height squared (in meters). It is also known as the Quetelet Index, named after its developer Adolphe Quetelet (Kolo, Dunbar, & Taarea, 2008). He was one of the first statisticians to apply the concept of a regular bell-shaped statistical distribution to physical and behavioural features (Davidson, 2008)

Ostir (2007) states that the BMI is one of the best indirect indicators of the degree of obesity. The WHO (2013b) also states that BMI is the most useful population-level measure of overweight and obesity, but should be considered as a rough guide because it may not correspond to the same degree of fatness in different individuals. In a more recent study, Gastelurrutia et al. (2011) conclude that BMI is the quickest and most affordable method, but it is questionable whether it is the best. However, it is a useful guide for assessing adiposity and is positively related with body fat content (Katz, 2003). The BMI can be applied to groups of people to determine trends or it can be applied to individuals. When applied to individuals, it is only one of the overall assessments used to determine health risks related to being underweight, overweight or obese (Davidson, 2008).

In 1998, the United States National Institutes of Health revised its weight definitions to bring them in line with the definitions used by the World Health Organization (Cohen & McDermott, 1998).

All adults aged 20 and above are evaluated on the same BMI scale as follows:

- BMI below 18.5: Underweight
- BMI 18.5 – 24.9: Normal weight
- BMI 25.0 – 29.9: Overweight
- BMI 30 and above: Obese

Some authors suggest that the optimal BMI for longevity appears to fall between 20.5 and 24.9 kg/m^2 for men and women of all ages, although evidence suggests that the longevity advantage may extend to those who are moderately overweight (Flegal, Graubard, Williamson, & Gail, 2005)

Quality of Life

Humans strive to create meaning in their lives and they struggle to achieve happiness by pursuing the things they value; therefore, speculation about how to achieve 'a good life' or 'good quality of life' is probably as old as humankind (Diener, Oishi, & Lucas, 2003). However, it is only in recent decades that there has been a growing interest in assessing the quality of life (QoL) in healthcare (Scientific Advisory Committee of the Medical Outcomes Trust, 2002), and conceptualizations of QoL in healthcare have been heavily influenced by earlier developments in the measurement of functional health status in medicine and the evolution of social indicators in the social sciences (Prutkin & Feinstein, 2002).

In order to provide a comprehensive assessment of the benefits and costs of a treatment, a broader range of measures, such as QoL instruments, were proposed (Wood-Dauphinee, 1999). Patient's QoL is increasingly measured as adjunct to more traditional clinical outcomes, and QoL has been a frequent term in medical literature. This reflects an increasing acceptance of a holistic approach to health that is more focused in keeping a bio-psychosocial model than the traditional biomedical model of disease (Engel, 1977). This change is due, in part, to the ageing of populations with a resulting increase in the prevalence of chronic and degenerative diseases. Since there are few curative treatments available, maintaining or improving QoL may be the most realistic goal. Furthermore, the intensive development in medical knowledge and technology combined with budgetary restrictions, have increased the demand for evidence-based healthcare and have marked the need to quantify the outcomes for the medical decisions, both at policy and individual level of treatment planning (Zou, Fielding, & Ondategui-Parra, 2004).

The major theoretical models of quality of life include classic models based on subjective wellbeing, happiness, morale, life satisfaction (Andrews, 1986); needs-based approaches derived from Maslow's (1962) hierarchy of human needs; gap models based on the discrepancy between desired and actual circumstances (Michalos, 1986); social-psychological models which emphasize autonomy and control, self-sufficiency, internal control and self-assessed technical performance and social competence (Abbey & Andrews, 1986); and phenomenological models of individuals' unique perceptions of their circumstances, based on the concept that quality of life is dependent on the individuals who experience it and should be measured using their own values systems (Rosenberg, 1995). Thus, it is clear that QoL means different things to different researchers and takes on different meanings according to the area of application. In the absence of any agreed formal definition of QoL, investigators circumvent the issues by describing what they mean by QoL, and then let the items (questions) in their questionnaire speak for themselves (Prutkin & Feinstein, 2002).

Putting Things Together

The recent literature review (see for example Ferrera, 2005; Seidel et al., 2010) indicates good agreement between BMI and indexes of QoL, health and mortality. Adjusting for factors that can potentially confound this relationship, such as smoking status and underlying disease, reduces the strength of the BMI-mortality relationship but does not eliminate it. Epidemiological data show a consistent relationship between increasing BMI and a variety of chronic illnesses, including type-2 diabetes, hypertension, coronary artery disease (e.g., heart attack), high cholesterol, sleep apnea, degenerative joint disease and certain cancers. Increasing BMI has also been associated with depression, low self-esteem, physical disability, social discrimination, and unemployment (National Heart, Lung, and Blood Institute, 1998).

In a large prospective study, Daviglus et al. (2003) reported that a higher BMI in middle age is associated with a poorer QoL in older age. In another large study, researchers (Ford, Moriarty, Zack, Mokdad, & Chapman, 2001) were examining the relationship between self-reported BMI and QoL in the general US adult population. They found that low and increased self-reported BMI significantly impaired health-related quality of life. In particular, deviations from normal BMI affected physical activity more strongly than mental functioning (Ford et al., 2001).

In cases of overweight and weight maintenance, weight loss is desirable and likely to be beneficial for physical function, vitality, and bodily pain. Kolotkin, Crosby, and Williams (2002) went a bit further and discuss in their research that there are differences in QoL across subgroups of overweight/obese individuals that vary according to the treatment-seeking status, treatment modality, gender, race, and BMI.

There is also a considerable number of articles stating that obesity (and in some of them overweight) is associated with poor levels of subjective health status, and a significantly lower QoL (see for example Doll, Petersen, & Stewart-Brown, 2000; Jia, 2005; Sach et al., 2007). Yet, Groessl, Kaplan, Barrett-Connor, and Ganiats (2004) found that overweight, but not obesity, did not have a significant impact on QoL in the population they examined.

On the other hand, there are studies that have reported no relationship between BMI and some psychological consequences as part of QoL measures. Some of them found little difference between obese and non-obese individuals on scores of psychological tests (Stunkard & Sobal, 1995) even after adjusting for waist-hip ratio (Lapidus, Bengtsson, Hallstrom, & Bjorntorp, 1989). Additionally, some research (Klesges, Klem, & Klesges, 1992) shows that changes in weight are not associated with changes in psychosocial functioning. Some clinical studies do not support the idea that overweight individuals are emotionally more disturbed than thinner individuals (e.g., Wadden & Stunkard, 1987). Another study (Kolotkin, Head, Hamilton, & Tse, 1995) found that in women, but not in men, BMI was not related to the impact of weight on self-esteem, which was substantial even in those of low BMI.

Living in a developing country, we were inspired to investigate our reality and make a contribution in this area, since we are facing the threat of a huge health problem burdening an overall difficult situation. The life in a transitional society has urged the nation to redefine its basic priorities, which, no doubt, had some consequences on the health issues. To our knowledge, this is the first study of its kind in the country dealing with the QoL, involving patients who might end with some type of heart surgery; some of them might receive stent(s), or many of them would have normal findings but may continue to have psychosomatic complaints. The purpose of our study was to investigate the differences of QoL secondary to the BMI in patients waiting for coronary angiography.

Method

Participants

The sample consisted of 100 patients with signs and symptoms indicative of coronary angiography. The participants had no other previously diagnosed serious health issues (stroke, myocardial infarction, chronic somatic disease or mental disorder, any form of disability).

The other relevant descriptive data are given in Table 1.

Table 1

Socio-Demographic Characteristics of the Patients (N = 100)

Characteristic	Statistics	
Age (years)	*M* = 60.2, *SD* = 9.8, *Min* = 37, *Max* = 79	
	N	**%**
Sex		
Men	68	68
Women	32	32
Body Mass Index (BMI)		
Underweight (BMI < 18.4)	0	0
Normal weight (BMI 18.5-24.9)	13	13
Overweight (BMI 25-29.9)	53	53
Obese (BMI 30 and above)	34	34
Marital status		
Married	64	64
Divorced	13	13
Widow/er	23	23
Education (in years)		
Elementary - 8 yrs	41	41
Intermediary - 12 yrs	45	45
Higher - more than 12 yrs	14	14
Smoking		
Smoker	53	53
Ex-smoker	29	29
Non-smoker	18	18
Work status		
Employed	43	43
Retired	19	19
Unemployed	38	38

Material

The patients completed the Duke Health Profile Questionnaire (DUKE) (Parkerson, Broadhead, & Tse, 1990). DUKE is intended as a brief and practical measure to evaluate the patient's reported functional health status in primary care settings.

The DUKE is a 17-item generic health status profile, from which six scales measure function: physical (five items), mental (five items) and social health (five items), general health (average score from physical, mental and social health), perceived health (one item), and self-esteem (five items). Five scales measure dysfunction: anxiety (six items), depression (five items), pain (one item), disability (one item), and an anxiety-depression scale that combines items from the anxiety and depression subscales (seven items). Note that several items are counted on one (or more than one) of the function measures and that the score is then reversed and the item is also included in one of the dysfunction measures. The questionnaire is self-completed; the time frame refers to the present or to the previous week. It was translated and adapted into Macedonian and, to our knowledge, this is the first time the instrument is used in the country.

Parkerson's original article describing the DUKE reported α-coefficients for the eight multi-item measures falling from .55 to .78; test-retest coefficients for the 11 measures ranged from .30 to .78 and exceeded .5 for all except pain and disability (Parkerson et al., 1990). Alpha reliability for the scale scores in a study of 314 ambulatory patients ranged from .49 to .70, whereas test-retest coefficients ranged from .41 to .72 (Parkerson, Broadhead, & Tse, 1992). A table summarizing convergent correlations between DUKE scales and other health measures is included in the Parkerson's Manual (Parkerson, 2002); coefficients typically fall in the range .50 to .70 (Parkerson, 2002). In our research, Cronbach's alpha for the multi-item scales ranged from .54 (Self-esteem) to .72 (Physical health). Although, in general, the data concerning its reliability and validity are low (of what we were aware), we chose this instrument because it is brief and with simple item formulations - not time-consuming and very much accepted by the patients in terms of comprehension and cooperation. Yet, in the future, in a more rigorous methodology, the choice of instruments will be reconsidered (but within the context of the setting demands and limitations).

Furthermore, the questionnaire's items were also used as a tool to introduce the patients to the counselling process, which is also of importance for us since it is part of our daily activities with them.

Procedure

The patients' data were collected on the same day, but before the coronary angiography was performed by right arm percutaneous radial artery catheterization. It is a procedure that uses X-ray imaging to see the flow of the blood through the arteries of the heart by using a type of dye (contrast material) that's visible by an X-ray machine. On average, the procedure lasts around 30 minutes. The catheterization lab is located in an outpatient setting within the Diagnostic Centre of the hospital. There we meet patients on a regular daily basis implementing a psycho-educational program. Health counselling and psychotherapy are also offered to the patients and their families. The data collection happened before implementing any psycho-educational or counselling program to the patients.

We introduced the patients to the testing procedure through a clinical interview. They all reported no severe psychological or neurological disorders and based on the interviews we had with them, we did not notice any major intellectual deficiencies.

For all of them BMI was calculated using the standard formula: BMI = kg/m^2.

Informed consent was obtained from all the participants involved in this study.

Statistical Analysis

Statistical analysis was accomplished by using the software for Windows (SPSS, version 19.0). Along with basic statistics, inferential statistics were also applied, i.e., independent samples *t*-test and one sample *t*-test.

Results

The mean BMI for the whole group was 28.91 kg/m^2 and the *SD* was 4.3. First, we found it quite informative to perform the one sample *t*-test defined by SPSS, version 19.0 tutorial as a procedure that tests whether the mean of a single variable differs from a specified constant. When the group was tested against 24.9 kg/m^2 (as upper limit of normal BMI), the results showed that the BMI mean of the whole group significantly differed from this value ($t(99) = 9.327$; $p < .01$).

The patients then were divided in two groups of 50, where the cut-off point was the BMI median value (28.35 kg/m^2). BMI is the independent variable and the eleven dimensions of the QoL questionnaire are dependent variables. An Independent Samples *t*-test was performed and the summarized results are presented in Table 2.

Table 2

Independent Samples t-Test of DUKE Scales

DUKE Scales	BMI Median cut-off	Mean (*SD*)	*t*	*p*
Physical health	≥ 28.4	48.40 (28.88)	0.875	.384
	< 28.4	53.00 (23.41)		
Mental Health	≥ 28.4	63.40 (21.25)	-2.819	.006
	< 28.4	73.60 (14.25)		
Social Health	≥ 28.4	64.20 (15.66)	-1.116	.267
	< 28.4	67.60 (14.77)		
General Health	≥ 28.4	58.66 (16.65)	-2.112	.038
	< 28.4	64.72 (11.58)		
Perceived Health	≥ 28.4	47.00 (35.58)	-2.707	.008
	< 28.4	65.00 (30.72)		
Self-Esteem	≥ 28.4	78.00 (19.17)	-1.376	.172
	< 28.4	82.80 (15.52)		
Anxiety	≥ 28.4	36.40 (18.17)	2.321	.022
	< 28.4	28.82 (14.24)		
Depression	≥ 28.4	39.80 (22.36)	2.706	.008
	< 28.4	29.40 (15.44)		
Anxiety-Depression	≥ 28.4	38.06 (19.56)	2.941	.004
	< 28.4	28.00 (14.23)		
Pain	≥ 28.4	38.00 (41.11)	0.257	.797
	< 28.4	40.00 (36.42)		
Disability	≥ 28.4	42.00 (40.86)	0.374	.710
	< 28.4	45.00 (39.45)		

Discussion

The fact that 87% of the group is overweight or obese is a single important factor that these people are at a greater risk of developing many diseases since the connection between BMI and ill-health is well established (as summarized in Ferrera, 2005; Seidel et al., 2010). The findings reveal that there are differences in some aspects of QoL in relation to the BMI.

As we can see from our data, patients with lower BMI tend to show better mental and general health features and perceive their health in a more positive manner compared to those with higher BMI. Furthermore, patients with lower BMI tend to be less anxious and depressed which indicates better mood compared to those with higher BMI. No differences were found in physical and social health, self-esteem, pain and disability.

The available research data are to some degree in agreement with these findings. For example, The National Heart, Lung, and Blood Institute (1998) reported that increasing BMI is associated with depression, low self-esteem, physical disability and social discrimination. In the study by Ford et al. (2001), increased self-reported BMI signi-

ficantly impaired the health-related quality of life. However, in this study, deviations from normal BMI affected physical functioning more strongly than mental functioning. Fine et al. (1999) stated that weight loss is desirable and beneficial for physical function, vitality, and bodily pain. Our data do not show this trend. In our research, we found that patients with higher BMI tend to show higher scores on the scales of depression and anxiety, and lower scores on mental and general health functioning and health perception. That is, these patients, in general, have lower psychosocial QoL. These findings are not in accordance with some earlier studies, which have reported no relationship between BMI and some psychological consequences as part of the QoL measures. Some of them found little difference between obese and non-obese individuals on the scores of psychological tests (Stunkard & Sobal, 1995) even after adjusting for the waist-hip ratio (Lapidus et al., 1989). Additionally, some research (Klesges et al., 1992) shows that changes in weight are not associated with changes in psychosocial functioning. Furthermore, some clinical studies do not support the idea that overweight individuals are emotionally more disturbed than thinner ones (e.g., Wadden & Stunkard, 1987).

Lacking any official research/statistical data regarding the BMI and QoL of the adult citizens with health issues in the Republic of Macedonia, we can conclude no more than the findings we obtained in our sample and call upon the research/statistics from the other countries. The results from this study are worrying because 53% of the patients were overweight and 34% were obese. These numbers are high above the data presented in the updated Fact sheet “Obesity and overweight” by the WHO (2013b), which reports that in 2008, 35% of adults aged 20 and over were overweight and 11% were obese. Overall, estimates showed that more than 10% of the world’s adult population was obese and that worldwide, obesity has nearly doubled since 1980. The bright side is that obesity is preventable.

Macedonian society cannot escape the globalisation processes. Although empirical data are lacking, in our conversations with patients, we are witness of an increased intake of energy-dense foods and of physical inactivity, due to the increasingly sedentary nature of many jobs, changing modes of transportation and a growing urbanisation of the country. The society is facing a “double burden” of the disease: rapid upsurge in obesity and overweight, particularly in urban settings, and it is not uncommon to find under-nutrition and obesity existing side-by-side within the same community (or even the same household).

In its report, WHO (2013b) also confirms that raised BMI is a major risk factor for non-communicable diseases such as cardiovascular diseases, diabetes, musculoskeletal disorders and some cancers. Considering this, and combining it with other findings (e.g., Dimova, Dojcinovski, & Mitrev, 2007; Dojcinovski, Naumoska, & Ristovska, 2010; Fine et al., 1999; Fontaine & Barofsky, 2001), while patients were waiting for their turn for a coronary angiography, we established a counselling contact and tried to introduce the concept of healthy habits as primary and most important factors to minimise potential risks. Among other things, psychological interventions are directed at regulating body weight as part of the positive health behaviour, which can benefit and improve some domains of the QoL of the individuals experiencing health problems.

Eating habits and regular physical exercise are behavioural aspects closely related to body weight. Genes, however, are not the cause of obesity epidemic. Even the highest heritability estimates (up to 40%) leave the majority of population variance in weight to be explained by non-genetic factors (Thomas & Brownell, 2007). We are satisfied if we manage to raise the awareness of patients, encouraging them towards active self-care which will inevitably reflect on their entire health status. When necessary, some of the patients were referred to individual or group

psychotherapy, since behavioural modification is a long process that requires closure of an old pattern and opening of a new, prosperous one.

Yet, we should also be aware of the methodological limitations of the study. The findings are inconsistent with some other studies mentioned earlier, so our contradictory findings could, in part be explained by sample differences and the variety of QoL measuring tools (questionnaires, scales, etc.) and statistical analyses used in the studies. Both external and internal validity are compromised due to the heterogeneity of the group, which draws on the variety of patients preparing for this diagnostic procedure where many possible diseases (if any at all) lie in the background of the signs and symptoms manifested. In this way, any generalization of the findings is very much limited. The boldest statement we can make is that there are certain tendencies, but the heterogeneity of the sample restricts further conclusions. Furthermore, bearing in mind the complexity of the concepts studied (BMI and QoL), it is impossible to suggest the direction of causality. So, the question whether BMI influenced the QoL outcomes, or the complex aspects of QoL have had an impact on the life style in general and, thus, influence body weight and self-care, cannot be answered. As it is common in QoL studies, many confounding variables pose a challenge to the researchers (age, gender, demographic data, socio-economic characteristics, health/illness history, etc.). This implies a new direction for creating a more rigorous methodology for future research since we consider this to be a pilot research.

The findings from this study, which emerge from our daily practice also imply the essential need to promote the health concept among Macedonian citizens who live in a transitional period for many years and active self-care has been forgotten – replaced – by the struggle for economic survival and the satisfaction of the basic human needs. In this context, an initiation for a development of a systematic rehabilitation programs is needed. It is based on this motivation that the Special hospital for surgery diseases, “Filip II”, has founded this Department in an attempt to fill part of this gap. In this sense, this research can be considered as a starting point for further and deeper exploration of this complex problem of health and QoL. Adequate psychological rehabilitation programs for these patients are more than necessary and the next step will deal with that issue.

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Competing Interests

The authors have declared that no competing interests exist.

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