

The effect of type 2 Diabetes Mellitus on health-related quality of life (HRQOL)

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Abstract

Improving the quality of life of all South Africans has become a major concern to health care practitioners, organisations and politicians. However, the paucity of local information on health-related quality of life (HRQOL) does not allow us to address this public health challenge. In order to rectify this deficiency and complement international research, we undertook a study with 281 Type 2 Black diabetic patients and 437 controls, with no self-reported chronic conditions, to ascertain HRQOL. We used the SF-20 to measure functioning, general health, well-being and bodily pain (HRQOL). It was hypothesised that diabetes mellitus significantly affects functioning, general health and well-being. Multiple analyses of covariance controlled for age, schooling, marital status, employment status and commodity ownership (a socio-economic measure). Patients were significantly more likely to report poorer role functioning, poorer general health and more pain than controls, providing partial support for the hypothesis. Reliability (internal consistency) coefficients on the four multi-item SF-20 sub-scales ranged between 0.79 (well-being), 0.81 (general health), 0.83 (physical functioning) and 0.94 (role functioning) for patients; for controls these coefficients ranged between 0.70 (well-being), 0.78 (general health), 0.80 (physical functioning) and 0.90 (role functioning). Inter-correlations among the sub-scales were significant for patients and controls ($p = 0.01$). It was concluded that the SF-20 is a reliable instrument for measuring HRQOL in both patient and control samples, and diabetes mellitus has more impact on general health and level of pain than on well-being.

Key words: Functioning, general health, well-being, quality of life

Abstrak

Die verbetering van lewenskwaliteit van alle Suid-Afrikaners is 'n prioriteit vir gesondheidsorg werkers, organisasies en politici. Gebrekkige plaaslike inligting rakende gesondheidsverwante lewenskwaliteit maak dit onmoontlik om hierdie uitdaging die hoof te bied. Om hierdie gebrek uit die weg te ruim sowel as om 'n bydrae tot internasionale navorsing te maak, het ons 'n studie met 281 tipe 2 diabete en 437 kontroles sonder bekende chroniese siektes voltooi om gesondheidsverwante lewenskwaliteit te evalueer. Die SF-20 was gebruik om funksionering, gesondheidswelstand en liggamspyn te bepaal. Die hipotese was dat diabetes mellitus funksionering, gesondheid en welstand betekenisvol beïnvloed. Ouderdom, skoolopleiding, huwelikstatus, werknemerstatus en gebruiksmiddeleienaarskap ('n sosio-ekonomiese evaluasie) is in 'n multi-ele analyse van kovariansie as kovariate gebruik. Pasiënte het betekenisvolle swakker rolfunksionering, algemene gesondheid en pyn gerapporteer wat die ondersoekte hipotese gedeeltelik ondersteun. Herhaalbaarheidskoëffisiënte van die vier item SF-20 subskale variëer van 0.79 (welstand), 0.81 (algemene gesondheid), 0.83 (fisiese funksionering) en 0.94 (rol funksionering) vir pasiënte en vir kontroles 0.70 (welstand), 0.78 (algemene gesondheid), 0.80 (fisiese funksionering) en 0.90 (rol funksionering). Inter-korrelasies tussen die subskale was betekenisvol vir pasiënte en kontroles ($P = 0.01$). Die gevolgtrekking is dat die SF-20 'n betroubare instrument was om gesondheidsverwante lewenskwaliteit in beide pasiënte en kontroles te bepaal en dat diabetes mellitus 'n groter impak het op algemene gesondheid en pyn as op welstand.

Introduction

World-wide, over 140 million people suffer from diabetes mellitus, with a projected increase to 300 million by the year 2025 (Preston, 1998). Type 2 (non-insulin-dependent) diabetes mellitus is the most common form of the disease in adults over 40 years, accounting for over 85% of all cases (Barceló, 1996). In South Africa, it has been "estimated that there are at least 1 million known diabetics and possibly up to an equal number who are currently undiagnosed" (Bonnici, Hough and Huddle, 1997, p. 440). South African studies in urban areas have reported prevalence rates for black (African) persons of between 5% and 8% (Levitt, Katzenellenbogen, Bradshaw, Hoffman and

Bonnici, 1993; Mollentze, Moore, Oosthuizen, Steyn, Steyn, Joubert, Muller and Weich, 1992; Omar, Seedat, Motala, Dyer and Becker, 1993), equating to approximately 1 million cases; a major public health challenge for South Africa.

Diabetes mellitus has implications for physical and social functioning, general health and well-being. Diabetes mellitus patients have been shown to be more susceptible to depression (Gavard, Lustman and Clouse, 1993), have poorer social integration (Lloyd, Robinson, Andrews, Elston and Fuller, 1993), and poorer functioning and general health than the general population (Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989). However, the relationship between diabetes mellitus and well-being is not a simple one. Studies in

the United States (US) and Finland have shown no substantial differences between diabetic patients, patients with no chronic conditions, the general population and controls on well-being (Aalto, Uutela and Kangas, 1996; Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989). It is possible that the impact of the disease on well-being is mediated by diabetic complications. While two studies have reported that better glycaemic control was associated with better functioning and well-being (Nerenz, Repasky, Whitehouse and Kahkonen, 1992; Van der Does, de Neethling, Snoek, Kostense, Grootenhuys, Bouter and Heine, 1996), one study found no association between these two outcomes (Weinberger, Kirkman, Samsa, Cowper, Shortliffe, Simel and Feussner, 1994). In South Africa, little attention has been paid to systematically assessing the functioning, general health and well-being of diabetic patients (health-related quality of life), despite improved quality of life being one of the treatment objectives (Bonnici, Hough and Huddle, 1997). Moreover, no local studies have compared the health-related quality of life (HRQOL) of diabetic patients and persons with no self-reported chronic conditions (controls). In order to rectify this deficiency and complement international research, we undertook a study to ascertain HRQOL in black diabetic patients and controls, with the hypothesis that diabetes mellitus significantly affects functioning, general health and well-being (HRQOL).

Materials and methods

The Questionnaire

A structured questionnaire, with a consent form, was designed to obtain information on: demographic variables (gender, age, schooling, marital status and employment status); socio-economic variables (commodity ownership index); and health-related quality of life (HRQOL).

The 20-item abbreviation of the Rand Medical Outcomes Study (SF-20) was used to measure HRQOL (Stewart, Hays and Ware, 1988). The 20 items form six scales: physical functioning, role functioning, social functioning, mental health, general health and bodily pain. The functioning sub-scales assess capacity to perform physical activities (walking, lifting, climbing), role limitations because of physical health problems, and social activity limitations due to health problems. Mental health is assessed by a 5-item affective measure of depression, positive affect, anxiety and psychological well-being. General health is measured by overall ratings of current health. The pain sub-scale is defined in terms of the extent of bodily pain. Overall health status is a combination of the six health measures.

Cut-off points for defining poor health have been developed for each of the scales. Poor physical and role functioning are defined as one or more limitations; poor social functioning as limitations a good bit of the time or more; poor mental health as a score of 67 or lower; poor general health as a score of 70 or lower; while for pain the cut-off point lies between mild and moderate pain (Stewart, Hays and Ware, 1988, p. 728). Scores on the six health measures and overall health status are transformed linearly to 0-100, where 0 and 100 are assigned to the lowest and highest possible scores, respectively. With the exception of pain, high scores denote better functioning, general health and mental health. High scores on the pain sub-scale denote more pain.

Reliability (internal consistency) coefficients for the four multi-item scales ranged between 0.76 and 0.88 (general population);

and between 0.83 and 0.87 (diabetic patients). Diabetes mellitus patients were significantly more likely ($p < 0.01$) to rate their functioning and general health as poorer than patients with no chronic conditions and the general population (Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989). Scores on the sub-scales were associated with the demographic characteristics of age, gender, education and income. With the exception of mental health, older persons reported poorer functioning and general health ($p < 0.01$) than younger persons; men reported better functioning than women ($p < 0.01$); and persons with more education and income tended to have better functioning and general health ($p < 0.01$) than persons with low education and income levels (Stewart, Hays and Ware, 1988).

Procedure

All Black patients attending a Diabetic Outpatients Clinic in Mamelodi for routine examination and treatment were asked to participate in the study. Only three patients refused to participate in the study. A multi-lingual trained Black female research assistant was employed to administer the questionnaire to the patients.

In 1995, 1,653 out of 6,933 households in an informal settlement in Soweto were visited to provide baseline data on health awareness, health status and health needs of the community. Out of these 1,653 households, 500 were randomly selected to provide the comparison sample with the diabetic patients. The same questionnaire, as used with the diabetic patients, was administered to 487 black adult residents of this informal settlement by 10 trained and paid black interviewers (residents of the area), who had been employed in previous annual studies in this informal settlement. As 50 respondents reported chronic conditions or disabilities, they were excluded from the analysis; leaving a sample size of 437 controls.

Ethical approval for the study was obtained from the University of Pretoria's Ethical Committee. The Nursing Service Manager and staff at the hospital were consulted and fully informed about the study. The Health Committee and the councillors of the informal settlement approved the study. Informed consent was obtained from the patients and residents of the informal settlement.

As measures of income are difficult to obtain, a Commodity Ownership Index was developed as an alternative SES measure (Westaway and Gumede, 2000). The Index consists of 10 items: telephone, car, television, refrigerator, separate freezer, stove, oven, microwave oven, radio and iron. Each item was scored 1 (yes) or 0 (no). Over 90% of patients and controls owned a stove, radio and iron. Since heterogeneous rather than homogeneous sample responses are required for index development (Nunnally, 1978), only 7 items were used for the index. Principal components analysis was used to develop a socio-economic score (SES) for each respondent, resulting in the equation:

$$\begin{aligned} \text{SES} = & 0.71 (\text{telephone}) + 0.45 (\text{car}) + 0.57 (\text{television}) \\ & + 0.57 (\text{refrigerator}) + 0.47 (\text{separate freezer}) \\ & + 0.63 (\text{oven}) + 0.42 (\text{microwave oven}) \end{aligned}$$

Socio-economic scores can range between 0 [0.71(0) + 0.45(0) + 0.57(0) + 0.57(0) + 0.47(0) + 0.63(0) + 0.42(0)] and 3.82 [0.71(1) + 0.45(1) + 0.57(1) + 0.57(1) + 0.47(1) + 0.63(1) + 0.42(1)].

Data Analysis

Data were analysed with the SPSS9, Windows package. Cronbach's alpha (1970), a measure of internal consistency, was estimated for the four multi-item SF-20 sub-scales (physical functioning, role functioning, mental health and general health). Reliability coefficients of ≥ 0.70 were regarded as satisfactory, based on Nunnally's (1978) recommendation.

T tests and analysis of variance were used to ascertain the effects of gender, employment status, patient/control and marital status on HRQOL. Pearson correlation coefficients were used to ascertain relationships between age, schooling and HRQOL. Multiple analyses of covariance (MANCOVA), with Bonferroni corrections for multiple comparisons, controlled for demographic (age, gender, schooling, marital status and employment status) and socio-economic (commodity ownership) effects on HRQOL.

Results

Demographic Information

The questionnaire was administered to 281 patients (81 men and 200 women) and 487 controls (151 men and 336 women); 50 controls had a chronic disease/disability. These 50 were not included in the analysis. Analysis was conducted on 437 controls (140 men and 297 women). As expected, patients were significantly older ($p < 0.001$), had less schooling ($p < 0.001$), were widowed ($p < 0.001$), were unemployed ($p = 0.001$) and owned more commodities ($p < 0.001$) than controls (Table 1).

Descriptive Statistics for HRQOL

Mean scores, standard deviations and percentage scoring in the poor health range for the six sub-scales (physical function-

ing, role functioning, social functioning, mental health, general health and pain) are shown in Table 2. Patients were significantly more likely to report poorer physical and role functioning, poorer general health, more pain, but better social functioning ($p < 0.001$) than controls.

Older respondents had significantly poorer functioning and general health than younger respondents ($p = 0.01$); women had significantly poorer functioning ($p = 0.05$) but more pain than men ($p < 0.01$). Employed respondents had significantly better physical and role functioning, mental health and general health and less pain than unemployed respondents ($p < 0.01$). Widowed respondents had significantly poorer physical and role functioning and more pain than married or single respondents ($p < 0.01$). SES was significantly related to general health ($p < 0.01$). These demographic and socio-economic findings were similar to those reported previously for Americans (Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989; Stewart, Hays and Ware, 1988).

Reliability and Inter-Correlations among the Health Measures

Reliability (internal consistency) coefficients for patients ranged between 0.78 (mental health), 0.81 (general health), 0.83 (physical functioning) and 0.94 (role functioning); for controls, these coefficients were 0.70 (mental health), 0.78 (general health), 0.80 (physical functioning) and 0.90 (role functioning). All relationships among the six health measures were statistically significant ($p = 0.01$) for both patients and controls (Table 3). For patients, there were substantial correlations among the functioning sub-scales and between mental health and general health. The relationship between mental health and general health was similar for controls. These findings suggested that mental health and general health are integral components of well-being. For controls, the social functioning item was modestly related to the other health measures, suggesting that this item inadequately measured the social functioning of this sample (Table 3).

Multiple Analyses of Covariance

MANCOVA analyses, with Bonferroni corrections for multiple comparisons, controlled for age, gender, schooling, marital status, employment status and commodity ownership (Table 4). Although controls scored higher than the patients on two of the functioning sub-scales, mental health, general health and health status, and lower on the pain sub-scale, significant differences were found between patients and controls on two functioning sub-scales, general health, pain and health status. The findings on mental health were consistent

Table 1 Demographic information for type 2 diabetes mellitus patients and controls

Demographics		Patients		Controls	
		n	%	n	%
Gender:	Male	81	29	140	32
	Female	200	71	297	68
Age groups:	16-34 years	3	1	168	38
	35-44 years	22	8	161	37
	45-54 years	44	16	74	17
	55-64 years	110	39	26	6
	65+ years	102	36	8	2
	None	85	30	13	3
Schooling:	1-5 years	30	11	55	13
	6-7 years	48	17	72	16
	8-10 years	97	35	172	39
	11-12 years	21	7	125	29
	None	85	30	13	3
Marital status:	Single	32	11	210	48
	Married	150	54	193	44
	Widowed	80	29	13	3
	Other*	17	6	21	5
Employment status:	Employed	78	28	177	41
	Unemployed	203	72	260	59

Other* Separated, divorced, cohabit

Table 2. Descriptive statistics for the six health scales and percentage of patients (n = 281) and controls (n = 437) scoring in the poor health range

Measure	no. items	m	sd	% in poor health	
				Patients	Controls
Physical functioning	6	79.7	24.7	45	30
Role functioning	2	82.3	31.9	20	7
Social functioning	1	81.7	31.8	9	19
Mental health	5	71.8	21.8	38	39
General health	5	55.6	28.3	80	55
Pain	1	30.9	34.4	51	24

with those reported previously (Aalto, Uutela and Kangas, 1996; Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989). The results for physical functioning, general health and health status provided partial support for the hypothesis.

Discussion

Patients reported high levels of functioning on all three sub-scales, virtually identical to those found for US and Finnish diabetic patients (Aalto, Uutela and Kangas, 1996; Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989), providing considerable support for the validity of the functioning measures. The difference between patients and controls on social functioning may have been a reflection of residential area. The diabetic patients came from a well-established township, where they have lived for most of their lives. In contrast, the controls lived in an informal settlement, with basic facilities (water, sanitation and electricity) but without tenure. Perhaps this insecurity or lack of facilities is reflected in limited social activities. There was a non-significant difference ($p = 0.09$) between pa-

tients and controls on the mental health sub-scale, consistent with previous research in the US and Finland (Aalto, Uutela and Kangas, 1996; Stewart, Greenfield, Hays, Wells, Rogers, Berry, McGlynn and Ware, 1989). However, only 26% of Finnish patients and 40% of healthy controls reported good mental health; very low levels of well-being in comparison with US samples (78%) and our patients (62%) and controls (61%). Perhaps living in Finland is less conducive for well-being than living in the US or South Africa. Twenty per cent of our patients reported good general health; slightly less than the 28% of Finnish patients and considerably less than the 60% of US patients. Our patients had significantly higher levels of pain

Table 3. Intercorrelations among the health measures: patients (P) and controls (C)

Measure	P		C		P		C		P		C		P		C	
	2		3		4		5		6							
1. Physical	0.67	0.44	0.59	0.24	0.36	0.40	0.44	0.44	-0.56	-0.39						
2. Role			0.54	0.12	0.35	0.27	0.36	0.48	-0.41	-0.51						
3. Social					0.26	0.16	0.29	0.16	-0.28	-0.14						
4. Mental health							0.50	0.52	-0.35	-0.29						
5. General health									-0.43	-0.51						
6. Pain									-	-						

(51%) than controls ($p < 0.001$); similar to Finnish patients (48%), but considerably lower than the 74% found for US diabetic patients. These findings suggest that diabetes mellitus has more impact on the general health and well-being of Finnish patients than US or South African patients. The reliability (internal consistency) coefficients of each of the multi-item

Table 4 Adjusted mean scores (am), standard errors (se) and F tests for the six health measures

Measures	Patients		Controls		F
	am	se	am	se	
Physical functioning	78.4	1.9	80.4	1.4	0.5
Role functioning	76.5	2.5	86.0	1.8	6.8*
Social functioning	92.3	2.5	74.8	1.8	22.9**
Mental health	69.2	1.8	73.5	1.3	2.8
General health	44.0	2.0	63.3	1.5	42.9**
Pain	41.9	2.6	23.9	1.9	22.6**
Health status	63.8	1.3	69.1	0.9	8.3*

* $p = 0.01$, ** $p < 0.001$

Controlling for age, gender, schooling, marital status, employment status and SES

scales were acceptable, according to Nunnally's (1978) recommendation, for patients (0.78 to 0.94) and controls (0.70 to 0.90). These coefficients were similar to those reported for US diabetic patients and a general population sample (Stewart, Hays and Ware, 1988). Although substantial correlations were found among the functioning sub-scales for the patients, social functioning for controls was only modestly related to the other health measures. It would appear that this one item scale inadequately measured social functioning for controls. However, the substantial correlations between health perceptions and mental health for patients and

controls provided support for the validity of the general health and well-being measures (Stewart, Hays and Ware, 1988). It was concluded that the SF-20 is a reliable and valid HRQOL measure; South African Black diabetic patients tend to have poorer health and more pain than Black controls; and Finnish diabetic patients, in comparison with South African and US patients, have the poorest HRQOL.

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