Article

Somatoform disorders among patients attending walk-in clinics in Trinidad: prevalence and association with depression and anxiety

RG Maharaj MB BS MHSc DM
Senior Lecturer, Unit of Public Health and Primary Care, Faculty of Medical Sciences, The University of the West Indies, St Augustine, Trinidad

C Alexander MB BS
C H Bridglal MB BS
A Edwards MB BS
H Mohammed MB BS
TA Rampaul MB BS
S Sanchez MB BS
GP Tanwing MB BS
K Thomas MB BS

House Officers, Trinidad healthcare system

ABSTRACT

Objectives Somatoform disorders are common in international primary care settings, but have been little studied in the developing world. The objective of this study was to determine the prevalence of severe undifferentiated somatoform disorder, and its relationship to depression and anxiety, among patients attending walk-in clinics in Trinidad.

Methods The study participants, who were all aged 18 years or older and attending walk-in clinics at 16 randomly selected health centres, were surveyed between May and August 2007 using the PRIME-MD questionnaire.

Results There were 594 participants (the response rate was 92%), of whom 72.7% were female. Their ages ranged from 18 to 93 years, and 54.5% were over 50 years of age. In total, 37.2% were married and 25.9% were single. Indo-Trinidadians represented 43.1% and Afro-Trinidadians represented 36% of the study sample; 56.5% of the participants reported that their income was less than US$ 400 per month, and 65.7% were unemployed. At walk-in clinics in Trinidad, the estimated prevalence of severe undifferentiated somatoform disorder was 10.3% (95% CI: 7.86–12.74), that of hypochondriasis was 28.5% (95% CI: 24.9–32.1), and that of body dysmorphic disorder was 15.8% (95% CI: 11.9–18.7). Severe undifferentiated somatoform disorder was statistically significantly associated with gender and ethnicity but not with age, level of education, employment status or income. Chi-square testing found significant associations between the presence of severe undifferentiated somatoform disorder and both depression and anxiety ($P < 0.05$), between hypochondriasis and both anxiety and depression ($P < 0.05$), and between body dysmorphic disorder and depression ($P < 0.05$) but not anxiety. Regression analysis suggested that the demographic features that predicted severe undifferentiated somatoform disorder were being female or Indo-Trinidadian.

Conclusions Walk-in clinics in Trinidad that serve older patients on a lower income have a high proportion of patients with somatoform disorders as measured by the PRIME-MD scale. These patients exhibit many features of anxiety and depression. These findings have implications for medical training and service delivery.

Keywords: body dysmorphic disorder, hypochondriasis, primary care, somatoform disorders

Introduction

Somatoform disorders are a group of non-psychotic conditions that contribute to patient distress and over-utilisation of healthcare services.[1] Somatoform disorders include somatisation disorder, undifferentiated somatoform disorder, hypochondriasis, conversion disorder, pain disorder, body dysmorphic disorder, and somatoform disorder not otherwise specified.[2] They present significant challenges to healthcare systems because affected individuals make more frequent primary care visits, specialist visits and emergency room visits, and have more hospital admissions and higher inpatient and outpatient costs.[3] To the primary care physician these patients are challenging, as they show high levels of general health anxiety, excessive preoccupation with physical symptoms, and inaccurate or exaggerated beliefs about somatic symptoms, and they often demand unnecessary laboratory or imaging tests.[3]

Somatoform disorders are among the commonest mental health disorders in European primary care settings, with prevalence rates of between 16.1% and 22.3%,[1,4] and high comorbidity with anxiety and depression.[4,5] In a worldwide multicentre population-based study, Üstün and colleagues[6] found that 2.7% of the patients fulfilled the International Classification of Diseases 10th Revision (ICD-10) diagnostic criteria for somatisation disorder, and 0.8% of them fulfilled the ICD-10 criteria for hypochondriasis, according to the Primary Health Care version of the Composite International Diagnostic Interview (CIDI-PHC).

Initial studies of mental health problems among primary care populations in the West Indies suggested that there is a significant burden of depression and intimate partner abuse in the Caribbean literature.[7–9] However, there have been no reports on the prevalence of somatoform disorders, hypochondriasis or body dysmorphic disorder.

Recently, the World Health Organization (WHO) and the World Organization of Family Doctors (Wonca), when addressing the issue of integrating mental health into primary care populations, recommended that this strategy is the most viable way of ensuring that people receive the mental healthcare they need, and that it is essential that primary care workers are adequately prepared for and supported in their mental health work.[10] An important part of that preparation is determining the burden of disease. The objective of this study was to estimate the prevalence of somatoform disorders and their associated factors, as well as their association with depression and anxiety, among patients attending public non-fee-for-services walk-in clinics at health centres in Trinidad.

Methods

Setting

In Trinidad there are 79 health centres, most of which have walk-in clinics (where patients can present for any medical problem without an appointment). These clinics were stratified to represent all regional health authorities, and 16 clinics were then randomly selected for administration of the questionnaire.

Participants

Participants were included in the study if they were aged 18 years or older, willing to participate, and had signed the consent form. Individuals who presented with an emergency on arrival at the clinic were excluded.

The questionnaire

The Primary Care Evaluation of Mental Disorders – Patient Health Questionnaire (PRIME-MD PHQ) is a screening questionnaire for mental health disorders. It has a specificity of 90%, a sensitivity of 75%, and is used to screen for somatoform disorders and other mental disorders.[11,12] This questionnaire is based on the DSM-IV and has been used in many populations[13,14] and medical settings.[15,16] The questionnaire was pre-tested in the local setting for patient comprehension of the language, the appropriateness of responses and the flow of questions, and was found to be easily understood. No additional validity or reliability testing was undertaken. The pre-tested questionnaires were administered by an interviewer. Responses to the questionnaire were scored based on the 'Reference Guideline for Interpreting the Patient Health Questionnaire and Brief PHQ', and the scores were used to determine the likelihood of being at risk of having a mental disorder.[17] From this guide the prevalence of somatoform disorders, anxiety and depression was determined.[17]

The Patient Health Questionnaire-15 (PHQ-15) is embedded within the PRIME-MD, and enquires about the presence of 13 common primary care symptoms in the last 4 weeks, rating each from 'not bothered' to 'bothered a lot.' The following symptoms were screened for: stomach pains, back pains, chest pains, pains in the arms, legs or joints, menstrual cramps or problems with periods, dizziness, headaches, palpitations, shortness of breath, constipation, loose bowels or diarrhoea, or nausea, flatulence or indigestion. Using this PHQ-15 scale, the somatic symp-

tom severity was calculated by assigning scores of 0, 1 and 2 to the response categories of 'not at all', 'bothered a little', and 'bothered a lot' for the 13 somatic symptoms. In addition, two items from the mood module of the PRIME-MD, namely fatigue and sleep, are given a score of 0 ('not at all'), 1 ('several days') or 2 ('more than half the days' or 'nearly every day'). Scores of 5, 10 and 15 represent cut-off points for low, medium and high somatic symptom severity, respectively. The prevalence of medium to high symptom severity was calculated, and statistical tests were performed for the patients with a high somatic symptom score versus all others. Hypochondriasis and body dysmorphic disorder are the other somatoform disorders screened for using the PRIME-MD questionnaire.

The severity of anxiety was calculated by assigning scores of 0, 1, 2 and 3 to the response categories of 'not at all,' 'several days,' 'more than half the days' and 'nearly every day,' respectively. The severity of anxiety symptoms is measured with the PRIME-MD questionnaire through the 7-item Generalized Anxiety Disorder scale (GAD-7). The GAD-7 total score for seven anxiety items ranged from 0 to 21. Scores of 5, 10 and 15 represent cut-off points for mild, moderate and severe anxiety, respectively. We reported any scores that were greater than 15.

In order to identify the presence of depression, participants were asked the following questions. 'Over the last 2 weeks, how often have you been bothered by any of the following:

(a) Little interest or pleasure in doing things?
(b) Feeling down, depressed or hopeless?
(c) Trouble falling or staying asleep, or sleeping too much?
(d) Feeling tired or having little energy?
(e) Having a poor appetite or overeating?
(f) Feeling bad about yourself, or that you are a failure or have let yourself or your family down?
(g) Trouble concentrating on things, such as reading the newspaper or watching television?
(h) Moving or speaking so slowly that other people could have noticed? Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual?
(i) Thoughts that you would be better off dead, or thoughts of hurting yourself in some way?'

The participants were asked to give the response 'Not at all', 'Several days', 'More than half the days' or 'Nearly every day' to each of the questions. Major depressive syndrome was identified if responses to items (a) or (b) and five or more of items (a) to (i) were at least 'More than half the days.' Item (i) was regarded as a positive indicator of major depressive syndrome if it was present at all.

To determine whether hypochondriasis was present, participants were asked 'In the last 4 weeks, how much have you been bothered by worrying about your health?' The possible response options were 'Not bothered', 'Bothered a little' or 'Bothered a lot.' Patients were only considered to be positive for possible hypochondriasis if 'Bothered a lot' was reported.

To determine whether body dysmorphic disorder was present, participants were asked 'In the last 4 weeks, how much have you been bothered by your weight or how you look?' The possible responses options were 'Not bothered', 'Bothered a little' or 'Bothered a lot.' Patients were only considered to be positive for possible body dysmorphic disorder if 'Bothered a lot' was reported.

Demographic information was also collected.

Analysis

Data were analysed using SPSS v.12. Associations between independent variables and the high somatic symptom scores, possible hypochondriasis or possible body dysmorphic disorder were analysed using the chi-square test with a statistical significance of 5%. Binary logistic regression was performed in order to determine which variable predicted the presence of severe (high-score) somatoform disorder.

Ethical approval

This study was approved by the Ethics Committee of the Faculty of Medical Sciences, The University of the West Indies (St Augustine campus) and the relevant regional health authorities (RHAs). It was co-ordinated and supervised by the first author and conducted by medical students as part of a compulsory second-year undergraduate research project. Patients were informed of the nature of the study, and consent was obtained from all participants.

Results

Interviews were conducted between May and August 2007. In total, 646 patients were eligible to participate and were approached, of whom 594 individuals agreed to take part (a response rate of 92%).

Demographic data for the patients

The age range of the patients was 18–93 years, and 72.7% of the participants were female. 37.2% were married, 43.1% were of Indo-Trinidadian descent and 42.8% had received no formal education. In total, 34.8% of the participants reported having an income of TTD 1000–2500 (1 US$ = 6.3 TTD), and 65.7% were unemployed. Table 1 provides further demographic information about the participants.

Severe undifferentiated somatoform disorder was identified in 10.3% of the respondents, hypochondriasis in 28.5% and body dysmorphic disorder in 15.8%. Table 1 shows the distribution of severe undifferentiated somatoform disorder.

Undifferentiated somatoform disorder

Severe undifferentiated disorder was identified in as many as 61 patients, scoring 15 points on the PHQ-15. Among the patients with a high symptom severity score, no one age group in particular was affected, and it was observed that many more females, individuals who were currently in a relationship and Indo-Trinidadians were affected ($P < 0.05$). Unemployed individuals reported more somatic symptoms compared with those who were employed, although this difference was not statistically significant. There was a strong statistically significant association between undifferentiated somatoform disorder and both depression ($P = 0.000$) and anxiety ($P = 0.006$).

Table 1 Demographic data for the respondents to the PRIME-MD questionnaire at walk-in clinics in Trinidad, and data for undifferentiated severe somatoform disorder

Variable		Severe undifferentiated somatoform disorder ($n = 594$)		P-value
		Negative	Positive	
Age	18–29 years	90 (89.1)	11 (10.9)	0.654
	30–49 years	149 (88.2)	20 (11.8)	
	$\geq$ 50 years	294 (90.7)	30 (9.3)	
Gender	Male	154 (95.1)	8 (4.9)	0.005*
	Female	379 (87.7)	53 (12.3)	
Highest level of exam passed	None/primary	357 (88.1)	48 (11.9)	0.156
	Secondary	93 (92.1)	8 (7.9)	
	Technical/vocational/ university	83 (94.3)	5 (5.7)	
Ethnicity	Afro-Trinidadian	200 (93.5)	14 (6.5)	0.007
	Indo-Trinidadian	217 (84.8)	39 (15.2)	
	Mixed/other	116 (93.5)	8 (6.5)	
Monthly income	< US$ 400	298 (88.2)	40 (11.8)	0.432
	US$ 400-1600	96 (90.6)	10 (9.4)	
	> US$ 1600	6 (100)	0 (0)	
	Not sure/no response	133 (92.4)	11 (7.6)	
Currently employed	Yes	187 (91.7)	17 (8.3)	0.163
	No	346 (89.7)	44 (11.3)	
Relationship status	Currently in a relationship	329 (88.0)	45 (12.0)	0.042*
	Not currently in a relationship	204 (92.7)	16 (7.3)	
Anxiety	Present	21 (72.4)	8 (27.6)	0.006*
	Absent	512 (90.6)	53 (9.4)	
Depression ($n = 593$)	Major depression	23 (54.8)	19 (45.2)	0.000
	Other depressive disorder	85 (85.7)	14 (14.3)	
	No depression	425 (93.8)	28 (6.2)	

*Fisher's exact test.

3d – 4/9/13 – 12:58
[This page: 85]

In total, 27.6% of those with anxiety and 45.2% of those with symptoms suggestive of major depression also had undifferentiated somatoform disorder (see Table 1).

Hypochondriasis

In total, 169 participants (28.5%) (95% CI: 24.9–32.1%) were 'bothered a lot' about their health. They were more likely to be female (72.6%), married (36.3%), poorly educated (44.9%), unemployed (66.2%) and with an income of less than TTD 5000 (58.9%). However, for none of these factors except level of education was there any statistically significant association ($P > 0.05$).

Body dysmorphic disorder

In total, 94 participants (15.8%) (95% CI: 11.9–18.7%) were 'bothered a lot' about their weight or how they looked. These tended to be the younger respondents, either 20–49 years (40.4%) or 50–59 years (26.6%) ($P < 0.05$) of age, female participants (88.3%) ($P < 0.05$), those with a lower level of educational achievement (89.3%) ($P < 0.05$) and those with lower incomes (74.5%) ($P > 0.05$).

Chi-square analysis

The variables age, gender, highest level of examination passed, reported income, marital status, ethnicity, employment, depression and anxiety were analysed in order to determine which of them were associated with the presence of a symptom severity score of ≥ 15 on the PHQ-15. Gender, ethnicity and the presence of depression and anxiety achieved statistical significance. The results are presented in Table 2.

Regression analysis

Binary regression analysis was performed in order to determine the predictors of severe undifferentiated

somatoform disorder. Female gender and being Indo-Trinidadian were the only statistically significant factors (see Table 3).

Discussion

This paper suggests that among this group with predominantly lower socio-economic status, 10.3% of the participants had high somatic symptom scores of ≥ 15 suggestive of severe undifferentiated somatoform disorder. In addition, many patients reported symptoms suggestive of hypochondriasis (28.5%) and body dysmorphic disorder (15.8%). Our findings differ only slightly from the results of other similar studies that used the PRIME-MD instrument in primary care. For example, we found a prevalence of 10.3% for severe undifferentiated somatoform disorder, compared with 11.3–18% in other reports.[13,14] Ansseau and colleagues reported that 18% of their sample had somatoform disorders, but did not subdivide these into mild, moderate and severe forms.[14] Our analysis suggested that there were statistically significant associations between severe undifferentiated somatoform disorder and gender, ethnicity and relationship status, and binary regression analysis suggested that being female or being of Indo-Trinidadian descent was a predictor of severe undifferentiated somatoform disorder. Furthermore, this study demonstrated in this population the strong link between depression and anxiety and the somatoform disorders. There was a strong statistically significant association between undifferentiated somatoform disorders and both depression and anxiety, and 27.6% of the participants with anxiety and 45.2% of those with symptoms suggestive of major depression also had undifferentiated somatoform disorder. These finding have important implications for the training of staff and the design and delivery of family medicine and primary care in Trinidad. As was discussed in the Introduction, patients with such mental health problems are often repeat attenders, with multiple complaints and incurring a higher cost overall.

Table 2 Other somatoform disorders and associated factors by univariate analysis ($P < 0.05$)

Other somatoform disorder	Associated factor ($P < 0.05$)
Hypochondriasis	Anxiety, depression
Body dysmorphic disorder	Age, gender, depression

Table 3 Results of the binary logistic regression to determine the independent predictors of severe undifferentiated somatoform disorder among patients attending walk-in clinics in Trinidad

Predictor	B	SE	Wald	df	Significance	Odds ratio	95% CI
Ethnicity							
Indo-Trinidadian vs. others	0.898	0.302	8.839	1	0.003	2.454	1.358–4.435
Employment							
Employed vs. unemployed	–0.129	0.332	0.150	1	0.698	0.879	0.458–1.687
Current relationship							
Yes vs. no	0.298	0.323	0.850	1	0.357	1.347	0.715–2.539
Gender							
Male vs. female	–0.874	0.406	4.628	1	0.031	0.417	0.188–0.925
Age							
$\leq$ 49 years vs. $\geq$50 years	0.354	0.297	1.422	1	0.233	1.425	0.796–2.550
Income							
High income (> 5000 TTD) vs. low income	–0.535	0.661	0.654	1	0.419	0.586	0.160–2.141
Constant	–2.292	0.738	9.561	1	0.002	0.102	

Strengths and limitations of the study

In other studies where the PRIME-MD was used there was a medical evaluation component that added a confirmatory element,[11,12] whereas this was not included in the present study. In those studies there was a high degree of consistency between the results of the PRIME-MD, especially its self-reported version, and the diagnosis from the clinical interview,[12] and this adds credibility to our findings. In addition, the wide cross-section of health centres that were included, the reasonable sample size, the high response rate and the congruity with the findings of international studies support the final results of this study. On reflection, we considered that the high response rate was due to three factors. First, the long waiting times at the clinics meant that patients could easily complete the questionnaire before their consultation. Secondly, the interviewers were all women who had undergone training, and therefore the participants may have been more comfortable talking about sensitive topics. Thirdly, for many of these patients the clinics provide an opportunity for social interaction, and they are very welcoming to the interviewers.

The PRIME-MD scale is primarily a screening instrument, and the results need to be validated with further diagnostic strategies. Furthermore, for hypochondriasis and body dysmorphic disorder only one question is included in the PRIME-MD for these domains, thus limiting the veracity of the findings. To truly understand the value of this study's results we need to answer two questions. First, what are the face validity and reliability of the PRIME-MD in this Trinidadian setting? Secondly, what are they in other societies where there is a preponderance of individuals of African and South Asian descent? The PRIME-MD has been applied in East Indian populations. For example, using the PHQ-9, Sidana and colleagues reported an overall prevalence of provisionally diagnosed depressive disorder and major depressive disorder of 21.5% and 7.6%, respectively, among medical students in New Delhi.[18] In Brazil the PRIME-MD was used in a similar developing-world population.[19] There is little information about validation of the PRIME-MD in these populations, and the scale seems to be acceptable in both. A parallel process, while development of the human resources and policy responses to these are ongoing, will be to validate tools for further use in the local context.

The future

This study raises many questions. What are the true diagnostic rates, given that the PRIME-MD is a screening test? What is the detection rate by physicians working in these walk-in clinics? To what extent is the presence of these conditions affecting

the patient's life and their current complaints? Are these patients overusing the healthcare system, as has been seen in international studies[1]? What are the underlying aetiological factors? What are the outcomes for these different categories of psychopathology? These questions form the basis for significant future research in primary care populations in Trinidad.

Utilisation of these results

The growing evidence of the prevalence of mental problems in Caribbean primary care populations mandates some level of action. Ideally there should be interventions at the political level, involving the creation of policies that strive to improve the mental health of the entire population. This can be attempted through public mental health approaches such as poverty alleviation, zero tolerance of violence, increased opportunities for education, and environments for relaxation and exercise. In addition, we must use these results to increase awareness of the nature of mental health problems in this population, and at the academic level we need to shape curriculum reform in undergraduate and postgraduate medical education to reflect these trends.

The real challenge in developing countries is to integrate mental health issues into the primary care system. As we mentioned in the Introduction, a recent publication by the World Health Organization and Wonca addresses this issue, and their key recommendations include the integration of mental health services into primary care, the creation of health policy and legislative frameworks with support by senior leadership, adequate resources and ongoing governance, the coordination of primary care mental health services with a network of services at different levels of care and complemented by broader health system development, and ensuring that primary care workers are adequately prepared for and supported in their mental health work.[10]

In conclusion, we used a pre-tested interviewer-administered PRIME-MD in populations of walk-in patients attending 16 randomly selected health centres in Trinidad. This study found high levels of severe undifferentiated somatoform disorder, hypochondriasis and body dysmorphic disorder. We recommend that policy makers incorporate these findings into the primary care system in Trinidad through the development of new care models to enhance the delivery of mental health services to the population, in keeping with the 2008 recommendations by the World Health Organization and Wonca.

REFERENCES

1 De Waal MWM, Arnold IA, Eekhof JAH *et al*. Follow-up study on health care use of patients with somatoform, anxiety and depressive disorders in primary care. *BMC Family Practice* 2008;9:5.

2 Barsky AJ, Oray EJ and Bates DW. Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity. *Archives of General Psychiatry* 2005;62:903–10.

3 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Primary Care Version. International version with ICD-10 codes*. American Psychiatric Association: Washington, DC, 1996.

4 Fink P, Sørensen I, Engberg M *et al*. Somatization in primary care. Prevalence, health care utilization, and general practitioner recognition. *Psychosomatics* 1999;40:330–38.

5 De Waal MWM, Arnold IA, Eekhof JAH *et al*. Somatoform disorders in general practice: prevalence, functional impairment and co-morbidity with anxiety and depressive disorders. *British Journal of Psychiatry* 2004;184:470–76.

6 Üstün TB and Sartorius N. *Mental Illness in General Health Care: an international study*. John Wiley & Sons: Chichester, 1995.

7 Maharaj RG. Depression and the nature of Trinidadian family practice: a cross-sectional study. *BMC Family Practice* 2007;8:25.

8 Maharaj RG, Reid SD, Misir A *et al*. Depression and its associated factors among patients attending chronic disease clinics in southwest Trinidad. *West Indian Medical Journal* 2005;54:369–74.

9 Maharaj RG, Alexander C, Bridglal CH *et al*. Abuse and mental disorders among women at walk-in clinics in Trinidad: a cross-sectional study. *BMC Family Practice* 2010;11:26.

10 World Health Organization/Wonca. *Integrating Mental Health into Primary Care: a global perspective*. WONCA: Singapore, 2008.

11 Spitzer RL, Williams JB, Kroenke K *et al*. Utility of a new procedure for diagnosing mental disorders in primary care. The PRIME-MD 1000 study. *Journal of the American Medical Association* 1994;272:1749–56.

12 Spitzer RL, Kroenke K and Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *Journal of the American Medical Association* 1999; 282:1737–44.

13 Norton J, De Roquefeuil G, Boulenger JP *et al*. Use of the PRIME-MD Patient Health Questionnaire for estimating the prevalence of psychiatric disorders in French primary care: comparison with family practitioner estimates and relationship to psychotropic medication use. *General Hospital Psychiatry* 2007;29:285–93.

14 Ansseau M, Dierick M, Buntinkx F *et al*. High prevalence of mental disorders in primary care. *Journal of Affective Disorders* 2004;78:49–55.

15 Schriger DL, Gibbons PS, Langone CA *et al*. Enabling the diagnosis of occult psychiatric illness in the emergency department: a randomized, controlled trial of the computerized, self-administered PRIME-MD diagnostic system. *Annals of Emergency Medicine* 2001;37:132–40.

16 Malmenström M, Bixo M, Björn I *et al*. Patients with psychiatric disorders in gynecologic practice–a three year follow-up. *Journal of Psychosomatic Obstetrics and Gynaecology* 2006;27:17–22.

17 Spitzer RL, Williams JB and Kroenke K. *Prime MD Today: evaluation of mental disorders*. Pfizer: New York, 2009.

18 Sidana S, Kishore J, Ghosh V *et al*. Prevalence of depression in students of a medical college in New Delhi: a cross-sectional study. *Australasian Medical Journal* 2012;5:247–50.

19 Almeida MS, Nunes MA, Camey S *et al*. Mental disorders in a sample of pregnant women receiving primary health care in Southern Brazil. *Cad Saude Publica* 2012;28:385–93.

CONFLICTS OF INTEREST

None.

ADDRESS FOR CORRESPONDENCE

Rohan Maharaj, c/o Unit of Public Health and Primary Care, Faculty of Medical Sciences, St Augustine, Trinidad and Tobago, West Indies. Tel/fax: 868 645 6741; email: rohan.maharaj@sta.uwi.edu