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Original article

Can registry data be used as a proxy for perceived stress? A cross-sectional study

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ABSTRACT

Purpose: This study explores the applicability of registry data as a proxy for perceived stress by examining the association between perceived stress measured in health surveys and registry data.
Methods: Of 35,700 randomly invited participants from the 2010 Health Survey in the North Denmark Region (age 16–99 years), 21,842 answered 10 items from Cohen's Perceived Stress Scale. Respondents were divided into quartiles based on their stress score. Survey information was individually linked to national registries containing information on prescribed psychiatric medication and consultations with psychologists or psychiatrists from 2009 to 2011.
Results: The percentage of persons with prescriptions or consultations was higher (37.6%) in the highest stress score group, compared with the lowest stress score group (7.7%). Odds ratio (95% confidence interval) for the highest score compared with the lowest score was 7.3 (6.5–8.1). Different combinations of treatment showed low sensitivity (8.7%–37.6%), positive predictive value (49.4%–56.8%), and positive agreement (16.2%–42.7%) were found, whereas specificity (88.5%–98.0%) and negative agreement (85.5%–87.2%) were higher. Kappa measure showed slight to fair agreement (0.104–0.285).
Conclusions: Participants reporting high perceived stress were more often prescribed medications and referred for consultations with psychologists or psychiatrists. However, due to low predictive values, registry data may not be suitable as a proxy for perceived stress.

Introduction

In several studies, self-reported perceived stress has been associated with the severity of disease and symptoms (e.g., coronary heart disease, asthma, and pain intensity), and the use of health care (e.g., after cancer treatment) [1–4]. One of the most widely used scales for measuring perceived stress is Cohen's Perceived Stress Scale (PSS), which measures the degree to which respondents felt they were unable to control important things in their life, their confidence in their ability to handle personal problems, how often they felt they could not cope with all the things they need to do, and how often difficulties were overwhelming within the past month [5]. Data on perceived stress can be collected through study-specific questionnaires and/or health surveys [6] and are used in epidemiologic research [1,7,8].

The validity of studies using data from questionnaires or health surveys may be threatened by the risk of misclassification and/or a low response rate. Furthermore, designing and conducting surveys can be time consuming and costly [9]. Registry-based studies have large sample sizes and, thus, high precision and a reduced risk of misclassification and bias due to nonresponse. However, data have been [10] collected for administrative rather than research use; therefore, relevant information may be unavailable [11].

According to Cohen [12], stress is seen as the product of two constructs, impinging demands and compromised resources, which conjoin to produce somatic and mental changes that put people at risk for pathology. Cohen has not described further theoretical aspects in the model, and the questionnaire has been found to be unidimensional in factor analyses. Stress, in general, has been found

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to be related to depression [13,14], anxiety [14], and presumably psychotic disorders [15]. These disorders can be treated with medication (i.e., antidepressants, antipsychotics, and anxiolytics) and/or consultations with psychologists or psychiatrists. Information about treatment can be found in the large Danish administrative registries and may work as a proxy for survey data on perceived stress. Therefore, the present study compared the information about perceived stress measured in health surveys and data with prescribed medications and consultations with psychologists or psychiatrists found in two different Danish national registries to evaluate whether registry data can be used as a proxy for survey data on perceived stress.

Materials and methods

Study design

This cross-sectional study was based on data from a Danish health survey conducted in 2010 and two Danish national registries from 2009 to 2011. Using the unique civil registration number (CPR number) assigned to all residents of Denmark [16], information on perceived stress from the North Denmark Region Health Survey was linked to two different administrative data sources containing information on prescribed medications and consultations with psychologists and psychiatrists in the primary sector.

In the North Denmark Region, a total of 35,700 randomly selected persons (age $>$ 16 years) received a questionnaire in February 2010; 23,392 (65.5%) returned the questionnaire [6]. The questionnaire was part of a nationwide survey. Nonresponders received two reminders. The questionnaire included 10 items constituting Cohen's PSS, among other questions. Each response to the PSS items was scored 0-4 and the scores summarized for a total score between 0 and 40. Higher scores denoted higher levels of perceived stress. Of the 23,392 persons who returned the questionnaire, 21,842 completed all the PSS items.

The PSS score groups were based on quartiles in accordance with other studies [1,17]: PSS score $<$ 9 (lowest PSS score group), 9–12 (second lowest PSS score group), 13–16 (second highest PSS score group), and $>$16 (highest PSS score group). Different group sizes occurred because of the use of integers in the PSS score. In addition to perceived stress, information about gender and age was drawn from the survey, and the respondents were divided into three age groups: $<$40 years, 40–65 years, and $>$65 years.

Information from the survey was linked to two national registries covering all Danish citizens: (1) the Danish National Prescription Registry [18] and (2) the National Health Service Registry [19,20].

1) The Danish National Prescription Registry contains information about the prescriptions redeemed in Denmark. The type of medicine was classified by the Anatomical Therapeutic Chemical Classification System, and the three types of medicine used in this study were: anxiolytics (N05B), antipsychotics (N05A), and antidepressants (N06A). The number of prescriptions redeemed from 2009 to 2011 (i.e., 1 year before and after the respondents answered the questionnaire) was taken from the registries. Two variables were created, one describing whether respondents received any prescriptions and other containing the number of prescriptions reimbursed by each respondent during the period.
2) The National Health Service Registry contained information on the activities of health professionals (i.e., psychologists and psychiatrists) contracted within the Danish tax-funded and public health care system, which includes a large part of the primary sector [19,20]. In the National Health Service Registry, all persons, all providers, and select services were recorded through invoices [20]. For each respondent, the number of consultations with psychologists and psychiatrists was extracted for 2009–2011. Two variables were created, one describing whether respondents had consulted psychologists or psychiatrists and the other containing the number of consultations for each respondent.

Statistical analysis

The distribution of prescribed medications (anxiolytics, antipsychotics, and antidepressants) and consultations with psychologists or psychiatrists in the different PSS score groups were described using percentages and medians. The respondents were divided into three different age groups and the percentages of persons receiving prescriptions or consultations in each group calculated.

To determine the association between PSS scores and prescriptions or consultations, we applied logistic regression models presented with odds ratios (ORs) and 95% confidence intervals (CIs), adjusting the models for gender and age. Registry data from each year were analyzed separately to examine whether the associations changed depending on whether register data were collected before or after perceived stress was measured.

The agreement between the PSS score and prescribed medication and consultations with psychologists or psychiatrists was presented by: (1) sensitivity, specificity, and positive predictive value using PSS score as a gold standard, (2) positive and negative agreement, and (3) kappa measure.

Analyses with different combinations of numbers of prescriptions and referrals were conducted to test whether some combinations were better predictors than others. All analyses were performed using STATA version 11 (StataCorp. 2009, *Stata Statistical Software: Release 11*; College Station, TX: StataCorp LP. v).

Ethics

The Danish Data Protection Agency approved this study (Ref. GEH-2014-014). All data were linked and stored in computers held by Statistics Denmark and made available with deidentified personal information to ensure that individuals could not be identified. In accordance with Danish legislation, only aggregated statistical analyses and results are published [21,22]. Registry-based studies do not require written informed consent and ethical approval in Denmark [21,22].

Results

The completeness of answers to items on perceived stress among those who returned the questionnaire declined with age ($<$40 years, 95.9%; $>$65 years, 86.4%). The "missing group" represented 6.6% of the respondents.

Women had a higher mean PSS score than men (12.9 vs. 11.5), and more women than men received prescriptions or consulted psychologists or psychiatrists (19.2% vs. 11.4%). The most frequently redeemed medication was antidepressants, and the least redeemed was anxiolytics. Overall, 0.6% of the respondents redeemed prescriptions for anxiolytics, 3.5% for antipsychotics, and 12.1% antidepressants. A higher percentage of respondents consulted psychologists (3.2%) than psychiatrists (1.0%). The overall percentage of respondents who were prescribed medication or consulted psychologists or psychiatrists was 15.4%.

The percentage of respondents who received prescribed medication or consulted with psychologists or psychiatrists was higher (37.6%) in the highest PSS score group, compared with the lowest