

University of Groningen

Sex and gender differences in diabetes care

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Document Version

Publisher's PDF, also known as Version of record

Publication date:
2017

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Hendriks, S. (2017). *Sex and gender differences in diabetes care*. [Thesis fully internal (DIV), University of Groningen]. Rijksuniversiteit Groningen.

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Chapter 10

Summary

In many fields of medical research there is an increasing attention to the role of sex and gender differences in healthcare. Sex refers to the biological differences between men and women, whereas gender refers to attitudes and behaviours which could be either masculine or feminine (1).

Sex and gender research in the field of type 2 diabetes (T2D) showed that the negative impact of type 2 diabetes on different healthcare outcomes might be higher among women compared to men (2). However, whether this phenomenon holds true for the Dutch T2D population is yet unknown. It is hypothesized to be a combination of physiological, psychological, sociological and health-related factors that result in differences between men and women with T2D. Many of these factors differ between countries and cultures. The **aim of this thesis** was therefore to investigate sex and gender differences in diabetes care for patients treated in primary care in the Netherlands.

In this thesis, 'sex' is used to describe differences between men and women which are considered to be mainly caused by biological differences, and 'gender' is used to indicate differences which are considered to be mainly caused by psychological and behavioural differences. A large part of this thesis is based on the ZODIAC cohort, which consists of patients with T2D who are treated in primary care. Data of this cohort have been used to describe the treatment and control of cardiovascular risk factors in different years for men and women, and to describe the survival of men and women with T2D in primary care. The ZODIAC cohort has also been linked to the Netherlands Cancer Registry (NKR). Data of this linkage have been used to assess cancer incidence and risk of obesity-related cancers. Gender differences in patient activation, well-being and patients' evaluation of care have been assessed in cross-sectional studies based on the ZODIAC cohort. The results of the different chapters of this thesis will be summarized below.

Part 1 Sex differences

In **chapter 2**, sex differences in control of cardiovascular risk factors were reported for patients with T2D treated in primary care from 1998 to 2013. This study showed a considerable improvement in quality of care for both men and women with T2D, yet a few sex differences were found. Potentially relevant sex differences in improvement of care were observed for HbA1c, systolic blood pressure, BMI and smoking, whereby the differences between sexes converged throughout the study period. At the end of the study period, men were less frequently obese compared to women. Furthermore, men over 75 years of age had a lower blood pressure. In contrast, women had better cholesterol-HDL ratios, less frequently albuminuria, and smoked less compared to men.

For HbA1c no difference between sexes was observed anymore in the final 9 years. Overall, cardiovascular risk factors were not relevantly poorer controlled in either men or women with T2D.

The survival of T2D patients relative to the general population in the Netherlands was investigated in **chapter 3**. After 14 years of follow-up, relative survival for patients with T2D who were treated in primary care was 12% lower in men and 18% lower in women compared to age-matched men and women in the general population. This corresponds with a median survival that was 2.2 years lower in men and 3.5 years lower in women with T2D compared to men and women in the general population. Although the impact of T2D on survival seemed to be higher in women, no significant difference was found between sexes in the total study population. Only in patients with T2D without a history of cardiovascular disease a significant lower relative survival of women compared to men was found.

In **chapter 4**, cancer incidence of men and women with T2D was compared with the cancer incidence of men and women in the general population in the Netherlands in the periods 5 years before, around and 5 years after the diagnosis of diabetes. The results showed that cancer incidence peaked around diabetes diagnosis in both men and women. This peak in cancer incidence could probably be explained by increased detection as a result of additional attention, care, and diagnostic tests at the time of diabetes diagnosis. Clear sex differences were found. In men, an increase in incidence of cancer was found around diabetes diagnosis and in the period 5 years after diagnosis. In women, this higher incidence was also present as early as 5 years before diabetes diagnosis. The latter might be attributable to a higher incidence of breast cancer. Postmenopausal breast cancer is considered to be related to obesity (3). It is plausible that women put on weight prior to diabetes diagnosis. This may result in a higher occurrence and detection rate of breast cancer in screening programs prior to diabetes diagnosis in these women.

In **chapter 5**, the association between BMI and obesity-related cancers was investigated in both men and women with T2D. Results showed that BMI was positively associated with obesity-related cancers in men with T2D, with the exception of advanced prostate cancer. In women with T2D, BMI was associated with the total group of obesity-related cancers and with ovarian, endometrial and postmenopausal breast cancer. No association was found with non sex-specific obesity-related cancers in women with T2D.

Part 2 Gender differences

In **chapter 6** the relationship between lifestyle factors and emotional well-being in men and women with T2D was described. A positive relationship between physical activity and emotional well-being in both men and women was identified. Also, a negative relationship between smoking and emotional well-being was found in the total study population with T2D. However, the clinical relevance of both associations appears to be very limited.

Chapter 7 focused on gender differences in the degree of patient activation which is defined as the confidence, knowledge and skills which are needed for self-management. Between men and women with T2D, the degree of patient activation did not differ. Therefore, there is no justification for approaching men and woman differently with regard to the level of self-management tasks.

The results of **chapter 8** showed that there were some gender differences in patient-related factors which were associated with patients' evaluation of care of men and women with T2D in primary care. Nevertheless, the degree to which these factors together could explain the patients' evaluation of care was very low in both sexes. Therefore, in attempts to improve patients' evaluation of care, no different approach for men and women with T2D seems to be needed.

In this thesis, small sex and gender differences in several aspects of T2D were identified. However, the majority of these differences have probably no consequences for daily practice. Only sex differences in smoking prevalence, obesity and sex-specific cancer incidence need further attention. Except these aspects, it can be concluded that it is not necessary to fundamentally change care for men or women with T2D in primary care.

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