Short Communication

Television viewing time among statin users and non-users. The Polish Norwegian Study (PONS)☆

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A R T I C L E   I N F O

Article history:
Received 16 December 2016
Received in revised form 24 March 2017
Accepted 28 May 2017
Available online 1 June 2017

Keywords:
Statin
Sedentary lifestyle
Cardiovascular prevention

A B S T R A C T

Sedentary behavior has emerged as an independent cardiovascular disease risk factor. Uncertainty exists about the behaviors of statin users, who may exhibit either a healthy adherer or a false reassurance effect. We conducted this study in order to assess and compare TV viewing among statin users and non-users. We used data from a cross-sectional study of 12,754 participants, from south-east Poland, age 45 to 64 years in 2010–11. Statin use during last 30 days was recorded by trained nurses. Participants reported time spent watching TV/week.

There were 1728 (13.5%) statin users of which 628 (36.34%) had cardiovascular diseases. The prevalence of viewing TV ≥ 21 h/week was higher among statin users (29.72%) compared to non-users (23.10%) and remained 15% higher after adjusting for age, sex, education, smoking, chronic obstructive pulmonary disease and other chronic diseases (prevalence ratio, PR 1.15, 95% CI 1.06 to 1.25). We found a similar pattern in both those with and without prevalent cardiovascular disease.

In conclusion, we found a higher prevalence of prolonged TV-viewing among statin users than non-users. Future studies are needed to explore innovative behavioral interventions and patient counseling strategies to reduce TV viewing among statin users.

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1. Introduction

A physically active lifestyle and statin use represent key components of the antihyperlipidemic therapy in primary and secondary cardiovascular prevention (Stone et al., 2014; Piepoli et al., 2016). Sedentary behavior has emerged as a cardiovascular disease (CVD) risk factor, independent of physical activity (Thorpe et al., 2011; Young et al., 2016). The need to specifically address sedentary behavior has been recently recognized by the American Heart Association and the European Society of Cardiology (Piepoli et al., 2016; Young et al., 2016). While sedentary time includes various behaviors (e.g. recreational or work-related screen time, travel time), television viewing represents the main discretionary and modifiable component. Prolonged viewing has unfavorable, independent effects on various health outcomes (Young et al., 2016; Grantved and Hu, 2011). For instance, studies suggest that each additional 2 h per day in TV viewing independently increases the risk of diabetes by 20%–56% and the risk of coronary events by 17%–23% (Young et al., 2016; Keadle et al., 2015a). Viewing TV > 3 h vs. < 1 h/day has been reported to double the risk of all-cause mortality (Young et al., 2016) while the lowest mortality risk was observed in those who consistently watched TV < 21 h/week (Keadle et al., 2015b).

In spite of this body of evidence, uncertainty exists about the sedentary behaviors among those receiving cardiovascular prevention drugs. Thus, statin users may exhibit a healthy adherer effect (Dwyer-Lindgren et al., 2013; Simpson et al., 2006) translated into less sedentary behaviors or conversely may display a false reassurance phenomenon, with lower motivation for sustaining a healthy lifestyle (Redberg, 2014; Sugiyama et al., 2014) and a more pronounced sedentary behavior. Prolonged TV viewing represents one of the hallmarks of sedentary behavior, and its prevalence among statin users is little known. We conducted this study with the aim of comparing the prevalence of prolonged television viewing between statin users and non-users.

2. Materials and methods

The Polish Norwegian Study (PONS) is a prospective community-based investigation of risk factors for chronic diseases, conducted in the Kielce region of south-east Poland (Manczuk et al., 2015). The recruitment into PONS study was based on a broad media campaign. Study participants were recruited from the general populations of two...
geographically distinct regions, one urban and one rural, both containing a diverse but stable mix of long-term residents. The study enrolled 13,172 men and women, age 45–64 years in 2010–11. Standardized questionnaires collected information on demographics, medical history and lifestyle factors. Statin use during the past 30-day period was determined at the time of clinic visit by nurses who inspected participants’ medication bottles. TV watching was assessed based on the question: “On average, how much time per week do you spend at home, watching TV?” The response choices were categorized in groups of 5–10 h/week. We treated this variable as categorical and as binary (<20 and ≥21 h/week). The ≥21 h/week cutoff was chosen to reflect literature-based estimated TV viewing time associated with the lowest mortality (Keadle et al., 2015b). Metabolic equivalents of task (METs/week) were calculated for the activities reported in the International Physical Activity Questionnaire. Diet was assessed by a food frequency questionnaire. Poor diet was defined as a systolic blood pressure ≥140 mmHg, or diastolic blood pressure ≥90 mmHg, or self-reported hypertension diagnosis or use of antihypertensive medications. Diabetes was defined as fasting glucose ≥126 mg/dL, or self-reported diagnosis of diabetes, or use of antidiabetic medication.

Further adjustment for total physical activity did not change these estimates. We did not detect an effect modification by sex. Statin users had lower median METs/week of total physical activity than non-users (adjusted median difference of −217.57 METs/week, 95% CI of −380.62 to −54.51 METs/week). In a subgroup analysis by CVD status, we observed the same pattern of a higher prevalence of prolonged TV viewing among statin users than non-users.

More statin users than nonusers (14.72% vs. 8.29%) invoked their physical health status as the reason for being sedentary (PR 1.78, 95% CI 1.56 to 2.03). This relation persisted after adjusting for age, sex, prev-

### Table 1

| Characteristic                        | Statin users | Non-users | p-value |
|---------------------------------------|--------------|-----------|---------|
| Age, mean (SD) (years)                | 58.29 (4.55) | 55.27 (5.38) | <0.0001 |
| Less than higher education             | 74.25        | 69.78     | <0.0001 |
| Residence, rural                      | 33.91        | 38.76     | 0.0001  |
| Gender, men                           | 31.13        | 34.21     | 0.0120  |
| Smoking, current                      | 16.55        | 20.56     | <0.0001 |
| Obesity (BMI ≥ 30 kg/m²)              | 38.48        | 29.04     | <0.0001 |
| High WHR (≥102 cm men, ≥88 cm women)  | 52.49        | 40.07     | <0.0001 |
| Poor AHA diet                         | 33.74        | 41.19     | <0.0001 |
| LDL, mean (SD), mg/dL                 | 106.40       | 130.12    | 0.0024  |
| HDL, mean (SD), mg/dL                 | 34.41 (32.57)|<0.0001  |
| Hypertensionb                         | 66.09        | 33.02     | <0.0001 |
| Blood pressure control (<120/90 mmHg) | 54.63        | 54.12     | 0.6912  |
| Diabetesb                             | 13.60        | 4.86      | <0.0001 |
| Glucose control ≥100 mg/dL            | 57.41        | 68.41     | <0.0001 |
| Cardiovascular diseases               | 36.34        | 10.81     | <0.0001 |
| Chronic obstructive pulmonary disease | 1.39         | 0.64      | 0.0031  |
| Cancer                                | 3.76         | 3.42      | 0.7419  |
| Other chronic diseases                | 52.08        | 38.89     | <0.0001 |
| Aspirin for cardiovascular prevention | 34.61        | 8.74      | <0.0001 |
| Doctor visit within last 12 months    | 94.16        | 77.26     | <0.0001 |
| Hospitalization within last 5 years   | 49.31        | 35.91     | <0.0001 |
| Total physical activity, METs/week, Log mean (SD) | 7.97 (0.9) | 8.11 (0.9) | <0.0001 |
| Total physical activity, METs/week, Median (IQR) | 3000.00 | 3480.59 | <0.0001 |
| Viewing TV ≥21 h/week                 | 29.72        | 23.10     | <0.0001 |

* Figures are percentages, unless otherwise indicated.

b Hypertension was defined as a systolic blood pressure ≥140 mmHg, or diastolic blood pressure ≥90 mmHg, or self-reported hypertension diagnosis or use of antihypertensive medications.

d Diabetes was defined as fasting glucose ≥126 mg/dL, or self-reported diagnosis of diabetes, or use of antidiabetic medication.

### Table 2

| All, N = 12,754 | CVD death history, N = 1820 | No CVD history, N = 10,934 |
|-----------------|-----------------------------|---------------------------|
| Non-statin users| 1(Reference)                | 1(Reference)              |
| Model 1         | 1.17 (1.08 to 1.27)         | 1.23 (1.06 to 1.43)       |
| Model 2**       | 1.15 (1.06 to 1.25)         | 1.22 (1.06 to 1.41)       |

* Model 1 adjusted for age and sex.

** Model 2 additionally adjusted for education, smoking, prevalent CVD (except in models stratified by CVD), COPD and other chronic diseases.
4. Discussion

We found that statin users had a higher prevalence of prolonged TV viewing than non-statin users, independent of and in addition to lower levels of physical activity. Our findings suggest that statin users, with or without established cardiovascular diseases tend to have a poor adherence to clinical and public health recommendations for a physically active lifestyle.

While a plethora of studies have addressed various potential side effects of statin use on physiologic markers of muscle impairment, few studies compared sedentary behaviors among statin users and non-users. Our findings are consistent with those found in a population of older men (mean age 72 years) using device-based measurements of total physical activity. ([Lee et al., 2014]) Similar to a brief report, ([Thomsen et al., 2013]) we found a slightly lower prevalence of poor diet among statin users than non-users. These findings suggest that different mechanisms may be influencing different lifestyle behaviors. Our study expands these previous findings into a middle-age population of men and women. Our study has several strengths. In contrast to total physical activity measures expressed as METs/time period (either self-reported or device-measured) or to other measures (such as sitting time), a domain-specific behavior (TV watching) has important advantages: 1) it is better captured by self-reports ([Rosenberg et al., 2015]) and 2) it provides the behavioral context needed for targeting focused interventions ([Young et al., 2016]). Further, our data collection spanned a 16-month time window and thus our results are unlikely to be significantly influenced by seasonality. Other strengths of our study include large sample size, information on multiple covariates and community-based recruitment.

Our study has several limitations. Inherent to self-reported data, the information is subject to recall bias and the relations detected may be underestimated. However, evidence suggests that self-reported TV viewing time is usually accurate ([Young et al., 2016]). Our study was designed as a long-term study and not as a representative sample of the population. However, comparisons with other national studies reveal that the distribution of CVD risk factors is similar. While TV-viewing time in our study was collected as a categorical variable, a continuous scale would have offered a more detailed exploration of this behavior.

No data were collected on the duration of statin treatment and long-term adherence.

Our study has several clinical and public health implications. Health care professionals, preventive medicine and public health practitioners need to emphasize the benefits of physical activity not only in general population but also among statin users. The fact that statin users have more frequent contacts with health care professionals than non-statin users suggests that the clinical encounter represents an important window of opportunity. Patient counseling efforts need to incorporate evidence regarding the benefits of physical activity. For instance, a large body of evidence suggests that a physically active lifestyle can be as effective as treatment with statins, ([Naci and Ioannidis, 2015]) and that the two treatments combined confer more health benefits than either therapy alone ([Kokkinos et al., 2013]). Patient counseling and ultimately patient behavior need to reflect the fact that the pharmacological treatment is complementary to, and not a substitute, of a physically active lifestyle.

TV viewing remains the leisure activity that occupies most discretionary time among middle-aged adults in many developed countries ([Young et al., 2016]). For instance, in the USA, average TV viewing is 20 h/week, with >50% of the population spending >14 h/week ([Young et al., 2016; U.S. Department of Labor and Bureau of Labor Statistics, 2015]). In Europe, market reports place Poland among the top three European countries, with averages of 28 h/week of TV viewing (Office of Communication, Ofcom, 2015). While different reports use different methods of reporting TV-viewing time, they consistently show a high prevalence of this sedentary behavior in many populations. These findings suggest that interventions targeting this risk factor have potentially considerable public health impact. Such interventions may need to specifically address TV-related sedentary behavior, independent of targeting overall physical activity. Indeed, increasing the level of moderate-intensity physical activity was shown to eliminate the increased risk of death associated with high sitting time, but did not completely eliminate the increased risk associated with high TV-viewing time ([Ekelund et al., 2016]). While some interventions have been developed to target computer screen time among children, there is a need to develop innovative, more effective strategies to address prolonged TV viewing and other sedentary behaviors among adults.

The aim of our study was to document the prevalence of prolonged TV-viewing among statin users and non-users, and not to explain this behavior. The determinants of sedentary behavior are multifactorial and complex, including factors such as knowledge, health literacy, perceptions, attitudes, socio-economic and social environmental factors. Attempting to partition the role of these factors in determining sedentary lifestyle would require future studies.

While our findings do not support the “healthy adherer effect”, future studies are needed to further explore the potential for a “false reassurance” phenomenon or other reasons for the lack of compliance of statin users with a physically active lifestyle. While statins have been reported to impair muscle function, such side effects are rare and unlikely to impact the sedentary lifestyle at population level ([Stone et al., 2014; Piepoli et al., 2016]). Future studies need to consider the complex, multifactorial nature of behavioral change, including both individual and environmental factors. Detailed studies are needed to explore attitudes and perceptions about sedentary behaviors and to identify predictors of lifestyle-changes initiation and maintenance among statin users.

5. Conclusion

We found a higher prevalence of prolonged TV-viewing among statin users than non-users. Our findings suggest that statin users tend to display sedentary lifestyle behaviors, in spite of their increased need for a physically active lifestyle. Future studies are needed to explore innovative behavioral interventions and patient counseling strategies to reduce TV viewing among statin users.

Funding

Data collection was supported by the Polish-Norwegian Research Fund, Grant, PNRF-228-AI-1/07.

Acknowledgments

The authors thank Drs. Witold Zatonski, Lars J. Vatten and Paolo Boffetta for facilitating this study. The authors thank all other PONS investigators, the staff, and the participants of the PONS study for their valuable contributions. A full list of PONS investigators and participant institutions can be found at http://www.projectpons.pl. Further information on the PONS database and collaboration ideas should be directed to the P.I., Dr. Marta Manczuk at marta.manczuk@coi.pl.

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