



The Interaction between Diet and Air Pollution in Association with Type 2 Diabetes Mellitus: Introducing Yazd Health Study

Amin Salehi-Abargouei¹, Mohammad Ali Mohsenpour², Masoud Mirzaei^{3*}

¹ Nutrition and Food Security Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

² Department of Nutrition, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

³ Yazd Cardiovascular Research Centre, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

ARTICLE INFO

LETTER TO EDITOR

Article History:

Received: 16 April 2016

Accepted: 10 August 2016

*Corresponding Author:

Masoud Mirzaei

Email:

mmirzaei@ssu.ac.ir

Tel:

+98(35)38209100

Citation: Salehi-Abargouei A, Mohsenpour MA, Mirzaei M. **The Interaction between Diet and Air Pollution in Association with Type 2 Diabetes Mellitus: Introducing Yazd Health Study.** J Environ Health Sustain Dev. 2016; 1(2): 63-5.

Type 2 diabetes mellitus (T2DM) is a chronic life threatening metabolic disorder¹. Its prevalence is increasing globally². In the US, T2DM prevalence has been doubled during the past 20 years³. It is also predicted that the number of diabetic people will reach to 380 million by 2025 worldwide⁴. It was also estimated that about four million adults in Iran had T2DM in 2014 which was increased by 35% from 2007⁵.

Diet is one of the major risk factors of T2DM⁶. A recently published meta-analysis showed that "Healthy" dietary patterns containing vegetables, fruits, and whole grains can lower diabetes type II risk by 14%. It also reported that consuming higher amounts of red and processed meats, high-fat dairy and refined grains in the context of unhealthy pattern will increase diabetes risk by 30%⁶.

Also, air pollution was proposed to be associated with T2DM⁷. For instance, it is revealed that particulate matter (PM) and also persistent organic pollutants (POPs) have been related to T2DM^{7, 8}. It seems that unhealthy dietary

behaviors might increase the adverse effects of air pollution on human health. It is known that the air pollution exposure increases the oxidative stress which increases several chronic diseases including cardiovascular diseases (CVDs) and T2DM, moreover, dietary supplementation of antioxidants might modulate the acute effect of air pollutants⁹. We are not aware of any study trying to find the possible interaction between dietary factors and air pollution in relation to T2DM.

Yazd city located in the central part of Iran is one of the driest cities with an average rainfall around 60 millimeters per year¹⁰. Due to its harsh climate, the area under agriculture is very limited¹¹. Unfortunately the prevalence of type 2 diabetes mellitus in Yazd city has reached to an alarming rate of 16.3%¹² which is twice more than the overall prevalence of diabetes in the Iranian adults¹³⁻¹⁷. It is estimated that about one third of Yazd inhabitants are suffering from metabolic syndrome (MetS)¹⁸. A recently published study conducted in Yazd showed high rates of premature death,

cardiovascular and respiratory diseases associated with PM₁₀ and PM_{2.5}¹⁹. Furthermore, several studies have revealed that the consumption of fruits and vegetables are low in Yazd people particularly in older adults²⁰. Since both diet and air pollution might affect T2DM risk, it seems that population based studies in YAZD may provide a great opportunity in investigating the possible interaction between diet and air pollution in association with chronic diseases, particularly T2DM as the greatest public health concern in Yazd.

The Yazd Health Study (YaHS) is a population based prospective cohort study that has been conducted since 2014 on 10,000 residents of Yazd aged 20-70 years. Our objective was to study non-communicable diseases and their relevant risk factors. Demographic, socio-economic, psychological, lifestyle (physical activity, dietary habits, and beliefs) data and information about current diseases and medication use by participants were gathered using validated questionnaires by trained interviewers in the recruitment phase of the study. Furthermore, various anthropometrics and blood pressure measurements were carried out at the time of enrolment which are then going to be repeated every 4 years. After interview, blood pressure, pulse, and anthropometric measurements study participants were invited to give blood samples so that a biobank was established. Additionally, data on other environmental factors including dietary intakes, using a validated Willett-format food frequency questionnaire (FFQ), exposure to high and low electromagnetic fields, and air pollution are going to be measured at residence place of the participants, in the next stage of the study.

It is planned to repeat all the measurements every four years in order to assess changes occurring in various measured risk factors. Death, disabilities, and other various outcomes were extracted from the aggregated health information system of Yazd hospitals fed into the national SEPAS system. A six-month wash out period was considered to ensure that outcomes are relevant to the measured health factors.

Later, ethical approval was obtained from Ethics Committee of Shahid Sadoughi University of Medical Sciences, No. 17/1/73941. All participants submitted their informed consents to take part in this study. The study was funded by Shahid Sadoughi University of Medical Sciences and was then approved by research council of the university under grant No. 70341 on July 2014. Yazd Health Study (YaHS), as a large scale population-based prospective cohort study tries to provide a good source of data for examining the air pollutants in Yazd. It also investigates the interaction between these data and other environmental factors, particularly nutrition in association with T2DM. The study team welcomes interested researchers submitting related proposals to YAHS team at yahs.ssu.ac.ir.

This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) license, which permits others to distribute, remix, adapt and build upon this work, for commercial use.

References

1. Zimmet P, Alberti KG, Shaw J. Global and societal implications of the diabetes epidemic. *Nature*. 2001;414(6865):782-7. PubMed PMID: 11742409.
2. Yach D, Stuckler D, Brownell KD. Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. *Nat med*. 2006; 12(1): 62-6. PubMed PMID: 16397571.
3. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care*. 1998; 21(9): 1414-31. PubMed PMID: 9727886.
4. Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey, 1988-1994. *Diabetes Care*. 1998; 21(4): 518-24. PubMed PMID: 9571335.
5. Esteghamati A, Etemad K, Koohpayehzadeh J, et al. Trends in the prevalence of diabetes and

- impaired fasting glucose in association with obesity in Iran: 2005-2011. *Diabetes Res Clin Pract.* 2014; 103(2): 319-27. PubMed PMID: 24447808.
6. Maghsoudi Z, Ghasvand R, Salehi-Abargouei A. Empirically derived dietary patterns and incident type 2 diabetes mellitus: a systematic review and meta-analysis on prospective observational studies. *Public Health Nutr.* 2016;19(2):230-41. PubMed PMID: 25917191.
 7. Rajagopalan S, Brook RD. Air pollution and type 2 diabetes: mechanistic insights. *Diabetes.* 2012; 61(12): 3037-45. PubMed PMID: 23172950. Pubmed Central PMCID: 3501850.
 8. Magliano DJ, Loh VH, Harding JL, et al. Persistent organic pollutants and diabetes: a review of the epidemiological evidence. *Diabetes Metab.* 2014; 40(1): 1-14. PubMed PMID: 24262435.
 9. Romieu I, Castro-Giner F, Kunzli N, et al. Air pollution, oxidative stress and dietary supplementation: a review. *Eur Respir J.* 2008; 31(1): 179-97. PubMed PMID: 18166596.
 10. Alzaid AA, Dinneen SF, Turner ST, et al. Lack of correlation between sodium-lithium countertransport activity and insulin action in non- insulin- dependent diabetes mellitus. *Endocrinol Metab.* 1995; 2(4): 269-74.
 11. Alsuwaida A. Effect of salt intake on blood pressure in diabetic hypertensive patients in Saudi Arabia. *Saudi Med J.* 2007; 28(6): 909-12. PubMed PMID: 17530109. Epub 2007/05/29. eng.
 12. Lotfi MH, Saadati H, Afzali M. Prevalence of diabetes in people aged ≥ 30 years: the results of screen-ing program of Yazd Province, Iran, in 2012. *J Res Health Sci.* 2013; 14(1): 88-92.
 13. Esteghamati A, Gouya MM, Abbasi M, et al. prevalence of diabetes and impaired fasting glucose in the adult population of Iran national survey of risk factors for non-communicable diseases of Iran. *Diabetes Care.* 2008; 31(1): 96-8.
 14. Harati H, Hadaegh F, Saadat N, et al. Population-based incidence of Type 2 diabetes and its associated risk factors: results from a six-year cohort study in Iran. *BMC public health.* 2009;9(1):186.
 15. Afkhani M, Vahidi S, Vahidi A, et al. Epidemiological survey of NIDDM in persons over 30-year old in Yazd province. *Journal of Shahid Sadoughi University of Medical Sciences and Health Services.* 2001;9:22-7. [In persian]
 16. Dehghani Tafti AA, Ehrampoush MH, Mashahiri MR, et al. The role of screening program on early diagnostic of diabetes in Yazd Azad Shahr. *J Res Health Sci.* 2011; 3(1): 15-9.
 17. Azimi-Nezhad M, Ghayour-Mobarhan M, Parizadeh M, et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanisation, education, marital status and occupation. *Singapore Med J.* 2008; 49(7): 571.
 18. Sadr BS, Rafiei M, Namayandeh S, et al. Prevalence and criteria of metabolic syndrome in an urban population: Yazd Healthy Heart Project. 2007.
 19. Mokhtari M, Miri M, Mohammadi A, Khorsandi H, Hajizadeh Y, Abdollahnejad A. Assessment of air quality index and health impact of PM10, PM2.5 and SO2 in Yazd, Iran. *J Mazandaran Univ Med Sci.* 2015; 25(131): 14-230.
 20. Bahrami D, Mirzaei M, Salehi-Abargouei A. Dietary behaviors of elderly people residing in central Iran: A preliminary report of Yazd health study (YAHS). *Elderly Health Journal.* 2016; 2(1): 6-13.