Obesity Medicine 6 (2017) 18–22

Contents lists available at ScienceDirect

Obesity Medicine

journal homepage: http://www.journals.elsevier.com/obesity-medicine

Time to act on diabetes mellitus prevention in the West Bank, oPt: Current and future direct cost of diabetes and its complications

Niveen M.E. Abu-Rmeileh, PhD [a, *], Rula Ghandour, MPH [a], Awad Mataria, PhD [b], Sameera Awawda [a], Samer Jabr [c], Martin O'Flaherty, PhD [d]

[a] Institute of Community and Public Health, Birzeit University, Occupied Palestinian Territory
[b] EMRO Regional Office, World Health Organisation, Cairo, Egypt
[c] Ministry of Health, Occupied Palestinian Territory
[d] Department of Public Health and Policy, University of Liverpool, UK

ARTICLE INFO

Article history:
Received 22 March 2017
Accepted 7 April 2017

Keywords:
Diabetes
Complications
Direct medical cost
West Bank
LMIC

ABSTRACT

Aims: To estimate current and future direct cost of diabetes and its complications for the period 2010 and 2030.
Methods: This study is a prevalence-based approach that combines model-based forecasts of diabetes prevalence rates from the validated OPT IMPACT Diabetes forecast model, diabetes complications prevalence rates and health care costs and economic data. We use a societal and health care perspective and a time horizon to 2030, and costs were estimated as international US dollar adjusted for Purchasing Power Parity (PPP).
Results: The estimated direct costs for diabetes per person in 2012 was 1087 PPP dollars (281-1895 PPP dollar) and the direct costs of diabetes and its complications was 2156 PPP dollar (981-4508 PPP dollar). The estimated diabetes direct cost for the year 2012 was 184 million PPP dollar (47–320 million PPP dollar). The cost is expected to increase to 209 million PPP dollar (54–364 million PPP dollar) in 2015, 248 million PPP dollar (64–432 million PPP dollar) in 2020 and 300 million PPP dollar (77–523 million PPP dollar) in 3030 with 3% discounting rate assumption. The estimated direct cost of diabetes complications is 365 million PPP dollar in 2012, 491 million PPP dollar in 2020 and 595 million PPP dollar in 2030.
Conclusions: The burden of diabetes and its complications on the Palestinian health system is huge and actions are needed to address the increasing prevalence of obesity on one hand and providing proper diabetes management on the other hand.

1. Introduction

Diabetes imposes a heavy health burden globally, and particularly in low and middle-income countries (LMIC) like the occupied Palestinian territory (oPt). Globally, the increase in diabetes prevalence is accompanied with an increase in its complication (Susan van et al., 2010). Several studies reported the high prevalence of diabetes and selected risk factors for the Palestinian population (Husseini et al., 2000a, 2000b; Husseini, 2002; Abdul-Rahim et al., 2001a, 2001b; Abdul-Rahim, 2002), and in line with most countries, the prevalence of diabetes is expected to increase in the oPt if the current adverse major risk factors (obesity and smoking) trends persist (Abu-Rmeileh et al., 2013). In facts, some studies showed that obesity prevalence is increasing among Palestinian adolescents (Mikki et al., 2009) and associated with unhealthy dietary habits (Mikki et al., 2010).

Diabetes also exerts enormous economic pressure to the health system and individuals because of its chronic nature and severe complications. Global expenditure of diabetes treatment and prevention exceeded 230 million USD in 2007 and is expected to exceed 300 million USD in 2025 (van et al., 2010). In more vulnerable economies, the health, and social impact of diabetes is

* Corresponding author. Institute of Community and Public Health, Birzeit University, Ramallah, West Bank, Occupied Palestinian Territory, Occupied Palestinian Territory.
E-mail addresses: nrmeileh@birzeit.edu (N.M.E. Abu-Rmeileh), rghandour@birzeit.edu (R. Ghandour), matariaa@who.int (A. Mataria), s.m.awawda@gmail.com (S. Awawda), smrjabr@yahoo.com (S. Jabr), M.OFlaherty@liverpool.ac.uk (M. O'Flaherty).

http://dx.doi.org/10.1016/j.obmed.2017.04.001
2451-8476/

now a major challenge to these societies, and will become even more severe in the near future. A Recent review of evidence on the economic implications of diabetes and CVD in Africa showed that the cost of care is beyond the copy capacities of individuals, families and governments in most African countries (Kengne et al., 2013). This is common in other developing countries (Ramachandran et al., 2007).

Population-based obesity interventions include healthy eating and physical activity. Simulation model testing different intercessions indicated that health information and communication about healthy lifestyle, in addition to fiscal measure that includes taxation of unhealthy food, proper labeling and restriction on marking unhealthy diet are cost-effective and result in substantial health gain (Cecchini et al., 2010).

The economic cost of diseases in general and specifically diabetes and its complications in the oPt is understudied (Younis et al., 2015). In this study, we aim to estimate current direct cost medical of diabetes and its complications and estimate the future cost for the period 2010 and 2030.

2. Material and methods

This study is a prevalence-based approach that combines diabetes prevalence rates, diabetes complications prevalence rates and other health care costs and cost data.

Diabetes Prevalence: The study is based on the estimated diabetes prevalence for the years 2010 up to 2030 with the OPT IMPACT Diabetes Forecast model (Abu-Rmeileh et al., 2014). For this study, we estimated future diabetes prevalence under two scenarios: A) if diabetes risk factors follow similar trends as previous years and no intervention takes place and B) if obesity prevalence (which is the main risk factor for diabetes in this model) reaches certain level and stop rising as suggested by Geiss et al. (2014).

The prevalence of diabetes complications in the West Bank was assumed to be constant overtime. Diabetes complications distributions were obtained from the Palestinian Diabetes Complications and Control Study (PDCC) conducted in Ramallah governorate (2012) (Imseeh, 2013). These estimates were applied to the total West Bank population to estimate the number of people with complications (Imseeh, 2013). Diabetes complications were studied as micro-vascular complications (neuropathy, retinopathy and nephropathy) and macro-vascular complications (coronary heart disease (CHD), cerebrovascular disease (CVA) and peripheral vascular disease (PVD).

The cost of Diabetes and its complications: Cost data for the year 2012 was estimated based on the literature. An extensive literature review was conducted locally, regionally and internationally to obtain the direct medical cost estimates for diabetes and its complications as defined above. The search strategy included the following keywords: cost, economic burden, cost of illness, diabetes type II, complications, macrovascular, microvascular, direct cost, health care expenditure. Initially, the search started in PubMed, and then was expanded trying to find regional data. Any study that looked at the economic burden of diabetes and/or its complications defined as microvascular or macrovascular were included in the analysis. Because of the shortage of local and regional costing studies (as per our definition), mostly international costing studies were considered. Cost data was converted to PPP and then inflated to the year 2012 using cumulative country-specific inflation rates. Mean, minimum and maximum costs were identified and used as baseline estimates for the study. (Supplement 1).

Most studies included in estimating the final cost did ingredient costing, a bottom-up approach and were a prevalence based studies, estimating cost per patient. The direct medical costs included: outpatient care visits (number of physician visits including GP, Dialectologist and other specialists), paramedical visits (those include nurses, dietitian, psychotherapist, foot care, etc), procedures, hospitalization, emergency room visits, drug use. The cost of complications included: hospitalization, rehabilitation, nursing, home nursing, outpatient therapy, physician visits, diagnostic and therapeutic procedures such as CABG, PTCA, coronary angiography, Home health care, cardiac rehabilitation.

Using these cost estimates and diabetes population in the West Bank, cost per patent for each subgroup was estimated.

Sensitivity analysis: The baseline cost data for this study depended on estimated costs from different countries and on different time frames. Therefore, we conducted a sensitivity analysis with minimum and maximum costs.

3. Results

3.1. Diabetes prevalence

The prevalence of diabetes mellitus in the year 2010 was 15.3% and is expected to increase to 19.7% in 2017, 21.2% in 2020, 22.8% in 2025 and 23.4% in 2030 (Fig. 1). If the prevalence of obesity reached a natural plateau in 5 years as observed in the USA between 1980 and 2012, then the prevalence of diabetes mellitus is expected to reach 21.2% in 2020, 22.3% in 2025 and 22.5% in 2030.

3.2. The direct cost of diabetes

Based on the cost obtained from several studies, the estimated direct cost for diabetes per person in 2012 was 1146 USD (392–2336 USD) while the estimated direct cost for diabetes and its complications was 2056 USD (1411–3109 UDS). Table 1 presents all estimated costs for diabetes and its complications.

Table 2 shows the predicted diabetes and diabetes complications direct cost for the period 2012 up to 2030 accounting for 3%, 5% and 7% discounting rates. The estimated diabetes direct cost (without complications) for the year 2012 was 194 million USD (66–395 million USD). If no national intervention was taken by the governorate, the cost is expected to increase to 220 million (75–449 millions) in 2015, 261 million (89–532 millions) in 2020 and 316 million (108–644 millions) in 2030 with 3% discounting rate assumption.

Diabetes direct cost is estimated to take 11.9%–15.4% of the Total Health Expenditure in the period 2012–2030 (Table 3).

If obesity prevalence level off by the year 2017, the estimated

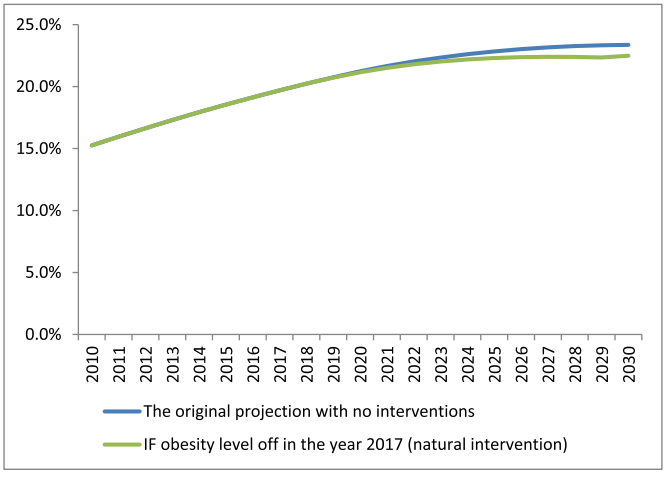

Fig. 1. Estimated diabetes prevalence for the period 2010–2030.

Table 1
The estimated direct cost of diabetes and its complications per person for the year 2012.

	Direct cost of diabetes only	Direct cost of diabetes & complications
Mean	$ 1146	$ 2056
Min	$ 392	$ 1411
Max	$ 2336	$ 3109

direct cost of diabetes would be 260 million (89–530 millions) in 2020, and 304 million (104–620 millions) in 2030 with a 3% discounting rate assumption (Table 2). Diabetes direct cost is estimated to take 11.5–15.4 of the Total Health Expenditure in the period 2012–2030 if obesity prevalence levels off in 2017 (Table 3).

The estimated cost increase dramatically when diabetes complications are included. The estimated direct cost of diabetes complications is 348 million in 2012, 469 million in 2020 and 567 million in 2030 if no intervention takes place (Table 2). If the prevalence of obesity stopped increases (if action is taken) in 2017, the estimated direct cost for diabetes and its complication almost drop by half. Consequently, the mean of the cost decrease when the discounting increase.

4. Discussion

Future trends of diabetes prevalence will have a profound impact on oPt health care budget and economy. The direct medical cost for diabetes is expected to increase by 1.6 folds between 2012 and 2030.A similar increase in direct medical cost was reported for China and Canada (Seuring et al., 2015). In 2030, between 567 USD (if obesity prevalence continues to increase)and 347 USD (if obesity prevalence stopped increasing) will be spent in tackling the obesity and diabetes epidemic, resulting in 20% total expenditure. This is clearly unsustainable since Health Expenditure is only 11% of GDP and 41% of the total health expenditure is out of pocket.

The study estimates the direct cost of diabetes and its complications using two scenarios: the first estimates the costs of diabetes if the current trends of diabetes risk factors remain the same with no intervention taking place. The second scenario estimates the costs when one of diabetes risk factors, obesity prevalence, reaches a saturation level and stop to increase as so called natural intervention. The differences in costs between the two scenarios are dramatic which highlight the importance of adopting population-based intervention targeting obesity. These scenarios were applied to estimate both the cost of diabetes alone and the cost of diabetes and its complications combined. The cost triples when diabetes complications are included in both scenarios.

Strengths: This study is using future prevalence estimates using a validated model. OPT IMPACT Diabetes Forecast model which was validated in several Arab countries and Turkey (Saidi et al., 2015; Al Ali et al., 2013; Sözmen et al., 2015). Further, because we are using cost estimates based on international and regional Literature, we presented the results with sensitivity analysis using the minimum

Table 2
The estimated direct cost of diabetes and its complications with 3%, 5% and 7% discounting rates.

Year	Direct cost of diabetes only			Direct cost of diabetes & complications		
	Mean	Min	Max	Mean	Min	Max
No Intervention						
3% discounting						
2012	194,052,122	66,377,340	395,554,761	348,142,375	238,924,558	526,446,812
2015	220,178,161	75,313,996	448,809,935	395,014,223	271,091,960	597,324,523
2020	261,239,284	89,359,336	532,508,698	468,680,601	321,648,019	708,719,838
2025	293,453,763	100,378,600	598,174,512	526,475,512	361,311,745	796,114,965
2030	316,356,255	108,212,611	644,858,823	567,564,101	389,510,188	858,247,467
5% discounting						
2012	190,355,891	65,113,010	388,020,385	341,511,092	234,373,614	516,419,253
2015	203,875,924	69,737,664	415,579,546	365,766,929	251,020,008	553,097,949
2020	219,720,114	75,157,317	447,876,254	394,192,456	270,527,994	596,081,880
2025	224,187,112	76,685,295	456,981,757	402,206,546	276,027,936	608,200,463
2030	219,526,530	75,091,099	447,481,653	393,845,153	270,289,646	595,556,703
7% discounting						
2012	186,797,837	63,895,944	380,767,667	335,127,707	229,992,799	506,766,557
2015	189,054,940	64,668,007	385,368,533	339,177,099	232,771,832	512,889,884
2020	185,404,174	63,419,229	377,926,834	332,627,385	228,276,868	502,985,671
2025	172,142,435	58,882,927	350,894,178	308,834,944	211,948,495	467,007,705
2030	153,388,189	52,467,862	312,665,627	275,188,583	188,857,534	416,129,039
Natural Intervention						
3% discounting						
2012	194,052,122	66,377,340	395,554,761	154,222,676	105,840,562	233,209,289
2015	220,178,161	75,313,996	448,809,935	180,119,813	123,613,354	272,369,893
2020	260,243,116	89,018,588	530,478,114	235,021,180	161,291,286	355,389,517
2025	286,614,869	98,039,292	584,234,149	293,927,680	201,717,878	444,465,543
2030	304,421,728	104,130,294	620,531,549	347,412,544	238,423,687	525,343,191
5% discounting						
2012	190,355,891	65,113,010	388,020,385	151,285,101	103,824,551	228,767,208
2015	203,875,924	69,737,664	415,579,546	166,783,541	114,460,884	252,203,322
2020	218,882,268	74,870,724	446,168,393	197,668,894	135,657,009	298,906,903
2025	218,962,467	74,898,156	446,331,869	224,549,165	154,104,510	339,554,161
2030	211,244,900	72,258,290	430,600,425	241,077,169	165,447,415	364,547,139
7% discounting						
2012	186,797,837	63,895,944	380,767,667	148,457,342	101,883,905	224,491,185
2015	189,054,940	64,668,007	385,368,533	154,659,028	106,140,024	233,869,123
2020	184,697,184	63,177,396	376,485,708	166,796,919	114,470,065	252,223,552
2025	168,130,683	57,510,670	342,716,644	172,420,438	118,329,396	260,727,209
2030	147,601,625	50,488,514	300,870,329	168,446,111	115,601,879	254,717,393

Table 3
The percentage of diabetes cost out of Total Health Expenditure.

Year	Direct cost of diabetes out of THE			Direct cost of diabetes & complications out of THE		
	Mean	Min	Max	Mean	Min	Max
3% discounting						
2012	15.4%	5.3%	31.3%	27.6%	18.9%	41.7%
2015	15.3%	5.2%	31.1%	27.4%	18.8%	41.4%
2020	14.1%	4.8%	28.8%	25.4%	17.4%	38.4%
2025	13.0%	4.5%	26.6%	23.4%	16.1%	35.4%
2030	11.9%	4.1%	24.3%	21.4%	14.7%	32.4%
5% discounting						
2012	15.1%	5.2%	30.7%	27.1%	18.6%	40.9%
2015	14.1%	4.8%	28.8%	25.3%	17.4%	38.3%
2020	11.9%	4.1%	24.3%	21.3%	14.7%	32.3%
2025	10.0%	3.4%	20.3%	17.9%	12.3%	27.0%
2030	8.3%	2.8%	16.9%	14.8%	10.2%	22.5%
7% discounting						
2012	14.8%	5.1%	30.2%	26.6%	18.2%	40.2%
2015	13.1%	4.5%	26.7%	23.5%	16.1%	35.5%
2020	10.0%	3.4%	20.5%	18.0%	12.4%	27.2%
2025	7.7%	2.6%	15.6%	13.7%	9.4%	20.8%
2030	5.8%	2.0%	11.8%	10.4%	7.1%	15.7%
Natural intervention	Mean	Min	Max	Mean	Min	Max
3% discounting						
2012	15.4%	5.3%	31.3%	12.2%	8.4%	18.5%
2015	15.3%	5.2%	31.1%	12.5%	8.6%	18.9%
2020	14.1%	4.8%	28.7%	12.7%	8.7%	19.2%
2025	12.7%	4.4%	26.0%	13.1%	9.0%	19.8%
2030	11.5%	3.9%	23.4%	13.1%	9.0%	19.8%
5% discounting						
2012	15.1%	5.2%	30.7%	12.0%	8.2%	18.1%
2015	14.1%	4.8%	28.8%	11.6%	7.9%	17.5%
2020	11.9%	4.1%	24.2%	10.7%	7.3%	16.2%
2025	9.7%	3.3%	19.8%	10.0%	6.9%	15.1%
2030	8.0%	2.7%	16.2%	9.1%	6.2%	13.7%
7% discounting						
2012	14.8%	5.1%	30.2%	11.8%	8.1%	17.8%
2015	13.1%	4.5%	26.7%	10.7%	7.4%	16.2%
2020	10.0%	3.4%	20.4%	9.0%	6.2%	13.7%
2025	7.5%	2.6%	15.2%	7.7%	5.3%	11.6%
2030	5.6%	1.9%	11.3%	6.4%	4.4%	9.6%

and maximum cost estimates. With these estimates we take into account the literature variations.

4.1. Limitations

As in any study, our analyses have limitations the direct costs were obtained from the literature. Whereas this data sources could not entirely be transferable to the oPt setting, it nonetheless provides a set of costs estimates that is grounded in empirical data from similar countries, providing estimates that can be critically appraised by policy makers more explicitly. Furthermore, our extensive sensitivity analysis effectively maps this uncertainty, providing useful boundaries for the future economic burden of diabetes in the oPt.

A further difficulty is the accurate estimation of indirect and intangible costs from a societal perspective which are inherently difficult and costly to measure accurately. This includes the effect of diabetes on patient's ability to continue working as effective as they used to before the onset of the disease, sickness, absence, disability, premature retirement or premature mortality (Ettaro et al., 2004; Tharkar et al., 2010). The last component of diabetes costs is the intangible costs which include pain, anxiety inconvenience and other factors that decrease the quality of life. However, even taking into account the huge uncertainty, our results were robust in the sensitivity analysis.

4.2. Public health implications

There should be quick prevention and intervention actions. Primary prevention to protect people from developing diabetes through targeting diabetes risk factors and try to slow down or stop the increasing prevalence of obesity and smoking. The emphasis should be on obesity structural interventions that prove to be cost saving. Such intervention may include reduce sugar intake through fiscal measures, improve nutrition through reformulation and regulation, facilitate physical activity through built environment, health promotion and education. Special attention should be given to susceptible individuals though lifestyle modification interventions (World Health Organization, 2013). As obesity prevention is key to prevent diabetes, additional gains from other diseases associated to obesity, including CVD, some cancers and musculoskeletal disease will make any investment in obesity prevention likely to be cost-effective if not cost-saving (Cecchini et al., 2010).

The World Health Organisation has proposed the best buys to reduce the burden of the Non-communicable diseases in general (World Health Organisation, 2011). Such cost −effective interventions need to be further evaluated and select which is best for the Palestinian context given its specific limited resources. Though none is completely adopted by policy makers, there are sporadic efforts. For example, the Palestinian Public Health Law includes few items that regulate tobacco. These items focus mainly on selling and advertising tobacco products. Still, it is missing the bylaws and it is not well implemented (Husseini et al., 2009).

Again, addressing NCDs and their risk factors requires a multidisciplinary action by all stakeholders including the government, civil society, development agencies, private sector and academia. All can provide the proper leadership, create infrastructure, set health polices, provide scientific evidence and expertise, and support implementation and action on the ground.

This study illustrates the huge burden of diabetes and its complication on the Palestinian health system. The prevalence of diabetes mellitus in the West Bank of the Occupied Palestinian territory is high and is expected to increase in the near future and thus estimates of current and future direct cost of diabetes and its complications can assist decision-makers understand the magnitude of the problem, and plan resource allocation and help prioritize interventions.

Conflict of interest

All authors declare no conflict of interest.

Acknowledgment

This paper is part of a larger collaborative project funded by the EU.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.obmed.2017.04.001.

References

Abdul-Rahim, H.F., 2002. The Metabolic Syndrome in a Rural and an Urban Palestinian Population: an Epidemiological Study of Selected Components of the Metabolic Syndrome, Including Diabetes, Hypertension, Dyslipidemia, and Obesity in the Adult Population of a Rural and an Urban Palestinian Community [PhD thesis]. University of Oslo.

Abdul-Rahim, H.F., Husseini, A., Giacaman, R., et al., 2001. Diabetes mellitus in an urban Palestinian population: prevalence and associated factors. East Mediterr.

Health J. 7 (1–2), 67–78.
Abdul-Rahim, H.F., Husseini, A., Bjertness, E., et al., 2001. The metabolic syndrome in the West Bank population: an urban-rural comparison. Diabetes Care 24 (2), 275–279.
Abu-Rmeileh, N.M.E., Husseini, A., Capewell, S., et al., 2013. Preventing type 2 diabetes among Palestinians: comparing five future policy scenarios. BMJ Open (12), 3. http://dx.doi.org/10.1136/bmjopen-2013-003558 [published Online First: Epub Date].
Abu-Rmeileh, M.E.N., Husseini, A., Capewell, S., et al., 2014. Preventing type 2 diabetes among Palestinians: comparing five future policy scenarios. BMJ Open 3. http://dx.doi.org/10.1136/bmjopen-2013-003558 [published Online First: Epub Date].
Al Ali, R., Mzayek, F., Rastam, S., et al., 2013. Forecasting future prevalence of type 2 diabetes mellitus in Syria. BMC Public Health 13 (1), 507. http://dx.doi.org/10.1186/1471-2458-13-507 [published Online First: Epub Date].
Cecchini, M., Sassi, F., Lauer, J.A., et al., 2010. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. Lancet 376 (9754), 1775–1784. http://dx.doi.org/10.1016/S0140-6736(10)61514-0 [published Online First: Epub Date].
Ettaro, L., Songer, T.J., Zhang, P., et al., 2004. Cost-of-Illness studies in diabetes mellitus. PharmacoEconomics 22 (3), 149–164. http://dx.doi.org/10.2165/00019053-200422030-00002 [published Online First: Epub Date].
Geiss, L.S., Wang, J., Cheng, Y.J., et al., 2014. Prevalence and incidence trends for diagnosed diabetes among adults aged 20 to 79 years, United States, 1980-2012. JAMA 312 (12), 1218–1226. http://dx.doi.org/10.1001/jama.2014.11494 [published Online First: Epub Date].
Husseini, A., 2002. Type 2 Diabetes Mellitus and Selected Associated Factors in an Adult Palestinian Population: an Epidemiologic Study of Type 2 Diabetes Mellitus and Impaired Glucose Tolerance (IGT) in Kobar and Ramallah, Palestine [PhD thesis]. University of Oslo.
Husseini, A., Abdul-Rahim, H., Awartani, F., et al., 2000. Prevalence of diabetes mellitus and impaired glucose tolerance in a rural Palestinian population. East Mediterr. Health J. 6 (5–6), 1039–1045.
Husseini, A., Abdul-Rahim, H., Awartani, F., et al., 2000. Type 2 diabetes mellitus, impaired glucose tolerance and associated factors in a rural Palestinian village. Diabet. Med. 17 (10), 746–748.
Husseini, A., Abu-Rmeileh, N., Mikki, N., et al., 2009. Cardiovascular diseases, diabetes mellitus, and cancer in the Occupied Palestinian Territory. Lancet 373 (9668), 1041–1049.
Imseeh, S.H.W., 2013. Type 2 Diabetes Mellitus Managment and Glycemic Control: Evidence from Ramallah Governorate Clinics-Palestine. Birzeit University.
Kengne, A.P., June-Rose Mchiza, Z., Amoah, A.G.B., et al., 2013. Cardiovascular diseases and diabetes as economic and developmental challenges in Africa. Prog. Cardiovasc. Dis. 56 (3), 302–313. http://dx.doi.org/10.1016/j.pcad.2013.10.011 [published Online First: Epub Date].
Mikki, N., Abdul-Rahim, H.F., Awartani, F., et al., 2009. Prevalence and sociodemographic correlates of stunting, underweight, and overweight among Palestinian school adolescents (13-15 years) in two major governorates in the West Bank. BMC Public Health 9 (1), 485. http://dx.doi.org/10.1186/1471-2458-9-485 [published Online First: Epub Date].
Mikki, N., Abdul-Rahim, H., Zumin, S., et al., 2010. Dietary habits of Palestinian adolescents and associated sociodemographic characteristics in Ramallah, Nablus and Hebron governorates. Public Health Nutr. 13 (9), 1419–1429.
Ramachandran, A., Ramachandran, S., Snehalatha, C., et al., 2007. Increasing expenditure on health care incurred by diabetic subjects in a developing country. A study India 30 (2), 252–256. http://dx.doi.org/10.2337/dc06-0144 [published Online First: Epub Date].
Saidi, O., O'Flaherty, M., Mansour, N.B., et al., 2015. Forecasting Tunisian type 2 diabetes prevalence to 2027: validation of a simple model. BMC Public Health 15 (1), 104. http://dx.doi.org/10.1186/s12889-015-1416-z [published Online First: Epub Date].
Seuring, T., Archangelidi, O., Suhrcke, M., 2015. The economic costs of type 2 diabetes: a global systematic review. PharmacoEconomics 33 (8), 811–831. http://dx.doi.org/10.1007/s40273-015-0268-9 [published Online First: Epub Date].
Sözmen, K., Unal, B., Capewell, S., et al., 2015. Estimating diabetes prevalence in Turkey in 2025 with and without possible interventions to reduce obesity and smoking prevalence, using a modelling approach. Int. J. Public Health 60 (1), 13–21. http://dx.doi.org/10.1007/s00038-014-0622-2 [published Online First: Epub Date].
Susan van, D., Beulens, J.W.J., Yvonne, T., van der, S., et al., 2010. The global burden of diabetes and its complications: an emerging pandemic. Eur. J. Cardiovasc. Prev. Rehabil. 17 (1 Suppl. l), s3–s8. http://dx.doi.org/10.1097/01.hjr.0000368191.86614.5a [published Online First: Epub Date].
Tharkar, S., Devarajan, A., Kumpatla, S., et al., 2010. The socioeconomics of diabetes from a developing country: a population based cost of illness study. Diabetes Res. Clin. Pract. 89 (3), 334–340. http://dx.doi.org/10.1016/j.diabres.2010.05.009 [published Online First: Epub Date].
van, D.S., Beulens, J.W.J., van der Schouw, Y.T., et al., 2010. The global burden of diabetes and its complications: an emerging pandemic. Eur. J. Cardiovasc. Prev. Rehabil. 17 (1_Suppl. l), s3–s8. http://dx.doi.org/10.1097/01.hjr.0000368191.86614.5a [published Online First: Epub Date].
World Health Organisation, 2011. From Burden to “best Buys”: Reducing the Economic Impact of NCDs in Low- and Middle-income Countries: Executive Summary 2011. Genava, Swizerland.
World Health Organization, 2013. Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. World Health Organization Document Production Services, Geneva, Switzerland.
Younis, M., Jabr, S., Al-Khatib, A., et al., 2015. A cost analysis of kidney replacement therapy options in Palestine, 52:0046958015573494 INQUIRY: J. Health Care Organ. Provis. Financ.. http://dx.doi.org/10.1177/0046958015573494 [published Online First: Epub Date].