

Biomedical Publications On Diabetes Mellitus, Research Gap In Developing Countries

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Diabetes today is a worldwide problem. The purpose of this study is to assess, in developed and developing countries, the productivity of research on diabetes and to evaluate the gap between the burden of diabetes and research conducted on diabetes.

Materials and Methods: An extensive search in PubMed database for diabetes publications (all publication types, all languages) using diabetes as the MeSH term was carried out to ascertain the proportion of diabetes-related publications from countries of different regional (according to WHO regions) and economic (according to World Bank) classifications in 1992, 1997 and 2002. We excluded all publications without the name of a country as affiliation, as we did for publications from the U.S. following which the quota of international publications of countries was calculated. All information related to the distribution of the global burden of diabetes was extracted from the literature available.

Results: Worldwide, the overall growth rate of publications on diabetes during 1992-2002 was 66.3% with a higher rate during 1997-2002, as compared to that of 1992-1997 period (31% vs. 27%). The highest growth rate was found in the South and East Asia region (226%), and the second highest in the Eastern-Mediterranean region (138%). However, the quota of the international publications of these two regions reached 3.9%

and 2.5% in 2002, respectively. Developed market economies (except for U.S.) contributed 85.4% (1668) of publications in 1992, 83.0% (2276) in 1997 and 76.7% (2806) in 2002. Contributions of developing countries increased from 12.3% (242) in 1992 to 13.8% (380) in 1997 and 19.8% (726) in 2002. Also, contributions of the developing eastern European countries rose from 2.2% (43) in 1992 to 3.1% (85) and 3.4% (125) in 1997 and 2002, respectively.

Conclusion: Despite the fast growth in prevalence of diabetes in developing countries, the quota of international publications on diabetes from developed countries is definitely higher than that of developing countries. Facilitating increases in financial resources and the indexing of national journals in these countries may serve to improve their quota.

Key Words: Diabetes, Publication, Developing Countries, Developed countries

Introduction

At the beginning of the 21st century, the worldwide diabetes pandemic affected about 151 million persons.¹ The number of adults with type 2 diabetes is estimated to increase to 225 million by 2010 and to 300 million by 2025.² Increasing levels of obesity, arising from energy-rich diets and sedentary lifestyles, associated with aging of the populations are the main factors contributing to this increasing prevalence.³ The major part of this numerical increase will occur in developing

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countries, so that it is expected that by the year 2025, more than 75% of people with diabetes will reside in developing countries, as compared with 62% in 1995.⁴ The increasing costs and social burdens associated with diabetes and its complications⁵ make it reasonable to enhance research on diabetes in developed, and more particularly, in developing countries. The aim of this study is to assess the productivity of research on diabetes in developed and developing countries and to evaluate the gap between the burdens imposed on them by the disease and the research conducted on it.

Materials and Methods

We searched PubMed for publications (all publication types, all languages) using "diabetes" as a MeSH term to ascertain the proportion of diabetes-related publications from countries of different regional and economic groups in 1992, 1997 and 2002. To assign a publication to a country, we used the affiliation of the first author. All publications without the name of a country as affiliation were excluded as was done for publications from the U.S. The quota of international publications of countries was then calculated. Member countries of WHO were categorized according to WHO regions: Pan American region (except for the U.S.), Europe and Middle Asia, Africa, Eastern Mediterranean, South-East Asia and Western Pacific regions. They were also classified on the basis of World Bank criteria into three groups: Developed Market Economies (DME) except for the U.S., Developing Eastern European (DEE) countries (including also middle Asian republics) and developing countries. A list of countries with developed market economies and developing eastern European countries is given in table 1. All other countries were considered as developing countries. To adjust numbers of publications according to the burden of diabetes imposed, the estimated

Table 1. Countries with developed market economies and developing eastern European countries

Developed Market Economies	Developing Eastern European Countries with middle Asian republics
Andorra	Albania
Australia	Armenia
Austria	Azerbaijan
Belgium	Belarus
Canada	Bosnia and Herzegovina
Denmark	Bulgaria
Finland	Croatia
France	Czech republic
Germany	Estonia
Greece	Georgia
Iceland	Hungary
Ireland	Kazakhstan
Italy	Kyrgyzstan
Japan	Latvia
Luxembourg	Lithuania
Malta	Poland
Monaco	Moldova
Netherlands	Romania
New Zealand	Russian federation
Norway	Slovakia
Portugal	Tajikistan
San Marino	Turkmenistan
Spain	The former Yugoslav republic of Macedonia
Sweden	Uzbekistan
Switzerland	Ukraine
U.K.	Yugoslavia
U.S.	

values of adult population and number of diabetics over 20 years were extracted and used.⁴

Results

In 1992, there were 5184 indexed publications in PubMed with the MeSH term of diabetes, a figure which rose to 6576 in 1997 and then increased until it reached 8624 in the year 2002. Worldwide the overall growth rate of publications was 66.3% during 1992-2002, with a higher rate during 1997-2002 as compared to that of 1992-1997 (31% vs. 27%). Excluding U.S. publications and those

without a country name in the affiliation, worldwide publications on diabetes reached 1953, 2741 and 3657 in 1992, 1997 and 2002, respectively, and the overall growth rate was 87.3% over ten years (Table 2). The highest growth rate of diabetes related publications was found in the South and East Asia region (226%), the second being in the Eastern-Mediterranean region (138%). However, the quota of these two regions reached 3.9% and 2.5% in 2002, respectively. In the Eastern Mediterranean region, Saudi Arabia, Kuwait, Egypt, Iran and Jordan in order of precedence made the most contributions in research publications in 2002. Considering the growth rate of publications, Iran's growth from nil in 1992 to 9 in 2002 was the highest rate in the EM region, although its quota on the international scale was only 0.2%. Developed market economies (except for the U.S.) contributed 85.4% (1668) of publications in 1992, 83.0% (2276) in 1997 and 76.7% (2806) in 2002 (Fig. 1). Contributions of developing countries increased from 12.3% (242) in 1992 to 13.8% (380) in 1997 and 19.8% (726) in 2002. The contributions of developing Eastern European countries also

rose from 2.2% (43) in 1992 to 3.1% (85) and 3.4% (125) in 1997 and 2002, respectively.

Calculating the numbers of publications per one million of adult people and adult diabetics showed that, considering the increasing prevalence of diabetes, this was only a small growth in publications in the world. As shown in Table 3, in 1997, the numbers of publications per one million adult diabetics in developing and DEE countries were very close; however in 2002, this number was 1.2 times higher in developing than in DEE countries.

Discussion

The percentage of contributions in publications on diabetes by developing countries has increased from 12.3% in 1992 to 19.8% in 2002. However, there is still a large gap between developed and developing countries regarding research on diabetes especially when the burdens of diabetes in these countries are considered.

The number of biomedical publications worldwide on diabetes has grown with rates of 27% and 31% during 1992-7 and 1997-2002, respectively. This growth has slightly exceeded the rise in population and number of adult diabetic patients during the same period. Hence, the number of publications per one million adults of the general population increased from about 1.9 in 1997 to 2.3 in 2002. In addition, this number per 10^6 of adult diabetic patients rose from 4.84 in 1997 to 5.52 in 2002. This could be due to an actual increase in diabetes research or to more extended indexing of journals in the PubMed database.

Promising evidence regarding diabetes research in developing countries has been found. Not only has the absolute number of publications on diabetes from developing countries increased prominently, but their relative quota of diabetes publications has also grown. Even more, both the ratios of their publications per 10^6 of the adult general population and that per 10^6 of adult diabetic

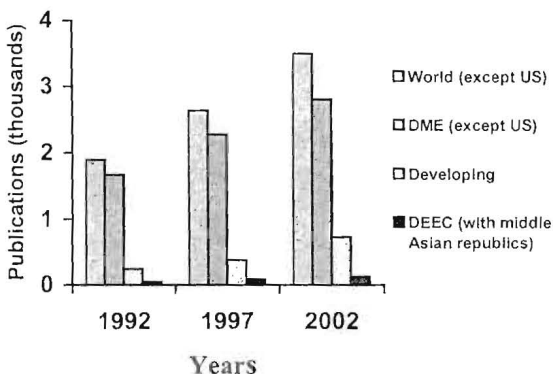


Fig. 1. Distribution of biomedical publications on diabetes in Developed Market Economies (DME) except U.S., Developing Eastern European Countries (DEEC) with middle Asian republics, and developing countries in 1992, 1997 and 2002

Table 2. Distribution of biomedical publications on diabetes in different WHO regions in 1992, 1997 and 2002

Location	Number of Publications			Growth Rate(%)
	1992	1997	2002	
Worldwide*	5184	6576	8624	66.3
Worldwide†	1953	2741	3657	87.3
Africa	24	27	44	83.3
Nigeria	6	6	11	83.3
South Africa	8	7	10	25.0
Cameroon	0	1	1	----
EMR‡	37	53	88	138
Egypt	7	6	11	57.1
Iran	0	2	9	----
Jordan	1	2	7	600
Kuwait	2	8	14	600
Saudi Arabia	14	13	20	42.9
Europe§	1137	1640	2034	78.9
Eastern Europe and Middle Asia	43	85	125	19.0
PAR	185	244	314	69.7
Brazil	18	27	43	138
Canada	123	171	230	86.9
SEAR¶	42	63	137	226
India	35	46	116	231
WPR**	468	608	877	87.3
China	20	30	111	455
New Zealand	13	21	32	146
Australia	87	130	160	83.9
Japan	333	396	508	52.5

* All publications worldwide; † Except for the U.S. and those without the name of any country in the affiliation; ‡ Eastern Mediterranean Region; § including middle Asian republics; || Pan-American Region (except U.S.); ¶ South-East Asian Region; ** Western Pacific Region.

patients have improved between 1997 and 2002. Nevertheless, these ratios (for developing countries and also, developing eastern European countries) are still far from their corresponding values in developed market economies. While 6.4 articles per 10^6 adults of the general population were published from countries with developed market economies (except U.S.) in 2002, the corresponding number was only 0.3 for develop-

ing countries. Again, the number of articles per 10^6 of adult diabetic patients in 2002 was 128.5 for developed market economies (except U.S.) and only 7.5 for developing countries. Taking into account the related data on diabetes research publications from the U.S. will surely widen the above mentioned gap between developing and developed countries regarding diabetes research.

The percentage of contributions in diabetes related publications, from European countries, more than 90% of which are from western Europe, has been relatively constant at about 58%. However, the fraction of publications from eastern Europe and the middle Asian republics has increased slightly during 1992-2002. The Western Pacific Region (WPR) countries contribute about 25% of diabetes-related publications at present. Of course, most publications from this region are from the four countries of Australia, China, Japan and New Zealand, indicating a paucity of diabetes research in other countries of this region.

In the Pan-American Region (PAR), a similar gap is observed between the North and South. Regardless of U.S. (excluded from this study due to its totally different situation), about two thirds of publications from this region are from Canada, and less than 1.5% of publications are from the Central or Latin American countries.

A prominent rising trend is observed for the South-East Asian Region (SEAR); however, its contribution is still too low especially in view of its high population. In addition, one must not overlook the fact that most of publications from this region are from India.

The most dismal situation regarding diabetes research is found in Africa. Not only is their contribution in diabetes-related publica-

tions very low, about half of which are from Nigeria or South Africa, but it has also remained nearly constant during this period.

The Eastern Mediterranean Region (EMR) also shows a rising trend in the number of diabetes publications, its contribution increasing from 1.9% in 1992 to 2.5% in 2002. However, over two thirds of publications in 2002 are from only the five countries of Saudi Arabia, Kuwait, Egypt, Iran and Jordan, the contributions of other countries being far too low. Among these five countries, Iran, Kuwait and Jordan show rapidly rising trends in publications.

Although the quota of international publications of developing countries has increased over the past years, it has done so very slowly and there is still a wide gap between developed and developing countries regarding research on diabetes. Considering the rising trend of the burdens imposed by diabetes, especially in developing countries, it seems vital to increase the financial support allocated for diabetes research in these countries. The gap, however, may be due to the fact that most articles from developing countries are published in journals not-indexed in PubMed. Development of a new database including such journals is suggested with a view to enhancing presentation of publications from developing countries.

Table 3. Distribution of adult general and diabetic population and biomedical publications on diabetes in Developed Market Economies (DME) except for U.S., Developing Eastern European Countries (DEEC) with middle Asian republics, and developing countries in 1997 and 2002

	1997					2002				
	Population‡ (×1000)	Diabetics‡ (×1000)	Number of Publications			Population§ (×1000)	Diabetics§ (×1000)	Number of Publications		
			Total	per 10 ⁶ population	per 10 ⁶ diabetics			Total	per 10 ⁶ population	per 10 ⁶ diabetics
World	3,397,604	135,904	6576	1.9	4.84	3,719,551	156,221	8624	2.3	5.52
DME*	424,870	20,416	2276	5.35	111.5	437,168	21,820	2806	6.42	128.5
DEEC*	284,285	18,805	85	0.35	4.5	293,841	20,155	125	0.42	6.2
Developing countries	2,500,842	81,905	380	0.15	4.6	2,792,135	97,099	726	0.26	7.5

* Except the U.S.;

† Including middle Asian republics

‡ Estimated values for 1995 were used according to reference 4.

§ Estimated values for 2000 were used according to reference 4.

References

1. Engelgau MM, Narayan KM, Saaddine JB, Vinicor F. Addressing the burden of diabetes in the 21st century: better care and primary prevention. *J Am Soc Nephrol.* 2003 Jul;14(7 Suppl 2):S88-91.
2. Zimmet P. The burden of type 2 diabetes: are we doing enough? *Diabetes Metab.* 2003 Sep;29(4 Pt 2):6S9-18.
3. Mayer-Davis EJ, Costacou T. Obesity and sedentary lifestyle: modifiable risk factors for prevention of type 2 diabetes. *Curr Diab Rep.* 2001 Oct;1(2):170-6.
4. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care.* 1998 Sep;21(9):1414-31.
5. World Health Organization. Non-communicable Disease Prevention and Control: Report by the Director General EB101/14. Geneva: World Health Organization; 1997.