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Screening for Type 2 Diabetes Risk Factors in a Greek Municipality towards Health-literate Healthcare

Bakides Sofoclis*, Kushitashvili Nino, Sakellariadis George

General Hospital of Molaoi Lakonia, Greece

Abstract Diabetes prevention is possible and a lot of strategies have been implemented worldwide. Unfortunately, we lack systematic efforts of combined Type 2 Diabetes risk factors screening with the concept for patients knowledge and evaluation of health information. This is true in semi-urban Greek areas stricken by the socio-economy crisis. We used the FINDRISK questionnaire and a knowledge attitude and perceptions questionnaire for cardiovascular risk factors. Totally 358 people were recruited from March to June 2014. Young doctors examined the patients and filled in the questionnaires after their fully informed consent. We have found 75 people (20,95%) with score >15. Mean age: 52,14 years and mean BMI: 27,43kg/m² Accordingly their knowledge about health risk factors >90% knew the significance of high blood cholesterol, Diabetes, bad diet, exercise, smoking, obesity and hypertension, but over 60% underestimated their exact mortality impact on cardiovascular events. In our area pilot study, the burden of the problem for future development of T2D is probably heavy. Although health risk factors knowledge is growing, there are gaps in the field of person oriented methodology approach for enhanced health literacy. We need the development of targeted intervention programmes towards interdisciplinary working, transparent decision-making and active health-literated involvement of patients.

Keywords Screening, Diabetes Type 2, Risk Factors, Health-literate, Healthcares

1. Introduction

The International Diabetes Federation's global estimates for 2011 suggest that 52 million Europeans aged 20–79 years old have DM and by 2030 this number will increase to over 64 million. [1]

In 2011, 63 million Europeans had IGT (Impaired Glucose Tolerance). A total of 317 million women and 281 million men worldwide died with DM (Diabetes Mellitus) in 2011, most from CVD (Cardiovascular Disease). The European healthcare expenditure in 2011 for DM was about 75 billion Euros and by 2030 is projected to increase to 90 billion. There is a lack of a unique biological marker when diagnosing T2DM (Type 2 Diabetes Mellitus) —besides post-prandial plasma glucose (PG)—that would separate IFG (Impaired Fasting Glucose), IGT, or T2DM from normal glucose metabolism.

T2DM develops following a prolonged period of euglycemic Insulin Resistance, which progresses to DM with increased risk of vascular complications. The present definition of DM is based on the level of glucose at which retinopathy occurs, but macrovascular complications such as cerebrovascular, coronary and peripheral artery disease appear earlier and are often present at the time when T2DM is diagnosed. Over 60% of people with T2DM develop CVD, a severe and costly complication. Thus, CVD risk should be given a higher priority when cut-points for hyperglycaemia are defined and should be re-evaluated frequently based on the CVD risk.

The DECODE study reported data on disorders of glucose metabolism in European populations. [16]

The data on HbA1c in these populations indicate major discrepancies, compared with results from an OGTT (Oral Glucose Tolerance Test), although this was not confirmed in DETECT-2. [17, 18]

In Europeans, the prevalence of DM rises with age in both genders. Thus, 10% of people below 60 years, 10–20% between 60 and 69 years and 15–20% above 70 years have been found with previously known DM and in addition similar proportions have detected asymptomatic DM. This means that the lifetime risk for DM is 30–40% in European populations. Also, the prevalence of IGT increases linearly from about 15% in middle aged to 35–40% in elderly Europeans. This is true even for HbA1c increases with age in both genders. [16,19]

In the US the prevalence of type 2 diabetes is increasing too, with age from 4,5% in 1995 to 8,2% in 2010.It is estimated from the ADA that the economic cost of Diabetes increased from 2007 to 2012. Under this trend it is projected that around 2050, 1 in every 3 adults will have Diabetes (diagnosed or not) [1, 2]

Today, partnerships with patients are at the forefront of healthcare service delivery and quality improvement efforts worldwide [40]. Nevertheless, we luck, so far, the

development of a systematic strategy from the HPH (Health Promoting Hospitals and Health Services) Network to involve patients in health promoting healthcare.

Furthermore, recommendations and accordance to definitions by WHO, partnering with patients, families and citizens in HPH Network requires that their needs and capabilities define direct service provision [38].

Patient-centredness is also a priority in Type 2 Diabetes (T2D) care. Identifying subgroups at high risk of poor outcomes is an important goal. In addition to obesity, age is one of the most important risk factors for T2D and the burden of the disease is very high in older age groups. So a key approach is to increase health promotion efforts especially for remote areas' T2D patients with difficult socioeconomic living conditions.

Diabetes prevention is possible and we know a lot of prevention strategies which have been implemented worldwide. Unfortunately, we lack systematic efforts of combined Type 2 Diabetes risk factors screening with the emerging concept for patients knowledge, ability to interpret and evaluate health information. Only then we can support more effective salutogenic life processes. This is even truer in semiurban Greek areas like our Municipality with much population groups stricken by the ongoing socio-economy crisis.

The aim of this pilot study was, for the first time in our area, to identify high-risk subjects for T2D combined with their evaluation on health risk factors using the FINDRISK questionnaire and a knowledge attitude and perceptions questionnaire for cardiovascular risk factors both validated in Greece.

2. Materials and Methods

More than 10 diabetes risk assessment tools have been developed world-wide, [8-19].

Components of seven diabetes risk models or scores with potential for adaptation for use in routine clinical practice are depicted at the following table:

Table 1. Diabetes Risk Models Scores

Score/study name, country, reference	Risk factors included in score	EXTERNAL	VALIDATION
ARIC(Atherosclerosis Risk in Communities), Germany, Schmidt 2005	Age, ethnicity, waist circumference, height, systolic blood pressure, family history of diabetes, Fasting plasma glucose levels, triglyceride levels, HDL, cholesterol levels	2010,USA AUROC =0.84	Hosmer-Lemeshow P<0.001, after recalibration P>0.10
Ausdrisk, Australia, Chen 2010	Age, sex, ethnicity, parental history of diabetes, history of high blood glucose, use of antihypertensive drugs, smoking, physical activity, waist circumference	Not externally validated but has been studied as part of an intervention to improve outcomes Hosmer-Lemeshow P=0.85	
Cambridge risk score, UK,Rahman2008	Age, sex, use of current corticosteroids, use of antihypertensive drugs, family history of diabetes, body mass index, smoking	2010,UK AUROC=0.72	Hosmer-Lemeshow P=0.77
FINDRISC, Finland, Lindstrom 2003	Age, body mass index, waist circumference, use of antihypertensive drugs, history of high blood glucose, physical in activity, daily consumption of vegetables, fruits, and berries	2010, Holland, Denmark, Sweden, UK, Australia AUROC=0.76	Hosmer-Lemeshow P=0.27
Framingham Offspring Study, USA, Wilson 2007	Fasting plasma glucose levels, body mass index, high density lipoprotein cholesterol levels, parental history of diabetes, triglyceride levels, blood pressure	USA 2010 AUROC=0.78	Hosmer-Lemeshow P<0.001, after recalibration P>0.10
San Antonio Risk score, clinical model, USA, Stern 2002	Age, sex, ethnicity, Fasting Plasma glucose levels, systolic Blood pressure, high density Lipoprotein Cholesterol levels, body mass index, Family History of diabetes in first degree relative	2010, USA 2010,Iran 2010,UK 2010, Iran AUROC 0.83 0.83 0.78 0.78	Hosmer-Lemeshow P<0.001, after recalibration P>0.10 Hosmer-Lemeshow P≤0.001 ,after recalibration P=0.131 Hosmer-Lemeshow P=0.42; Hosmer-Lemeshow P=0.264
QDScore, UK, Hippisley-Cox 2009	Age, sex, ethnicity, body mass index, smoking, family, History Of diabetes, Townsend Deprivation score, treated hypertension, cardiovascular disease, current use of corticosteroids	2011 UK AUROC=0.80 MEN AUROC=081 WOMEN	Brier score: 0.053 men, 0.041 women

AUROC=area under receiver operating characteristic curve [45]

Among them, Finnish Diabetes Risk Score (FINDRISC) is one of the most commonly used risk score in detecting undiagnosed diabetes. FINDRISC has some advantages over other diabetes risk scores.

First, FINDRISC is a simple self-administered questionnaire which can be used as a diabetes screening in primary care or community settings. It can be understood and easily calculated by a person or clinical personnel without the need of any laboratory test.

Second, FINDRISC was developed initially in a prospective study with an excellent performance in predicting the 10-year diabetes risk in Finnish population [12].

Third, FINDRISC includes eight clearly defined questions that cover all well proven risk factors of diabetes.

Fourth, FINDRISC has been evaluated in detecting individuals with undiagnosed diabetes and prediabetes in a cross-sectional study not only in Finland [21] but also in 15 other countries or regions and gained good validity in most of these populations [20], [22–35].

However, most previous studies have been conducted in European countries with the majority of participants as Caucasians [22–28] or other single racial groups [20], [29-35].

We have used the FINDRISK questionnaire because it was the only available validated from 2010 and there was no other available because of the Greek socio-economy crisis.

We used a knowledge attitude and perception questionnaire for cardiovascular risks factors which is validated in Greece.

Every study participant was asked about their knowledge for health risk factors like high blood cholesterol, Diabetes, bad diet habits, smoking, exercise, obesity and hypertension. They were also asked if they also knew their mortality impact according cardiovascular events.

We have also examined if there was any impact of age, BMI, marital status, number of kids, educational years, profession, employment, on the variables << attitude/perceptions about prevention>> and << level of risk factors knowledge>>

3. Research Design

The study was a cross sectional one performed in the Municipality area of Monemvasia, Lakonia, Greece. The population of this Municipality, according to the 2011 last census, was 22958 persons and the great majority (95%) was Greeks, residents of this area.

This quantitative research differs significantly from the methodological tools of knowledge acquisition, but also the theoretical starting point, with other surveys as its elements are primary. The Personal Method is also preferred, since the researcher himself comes in contact with the respondent, gives him the questionnaire and either completes it alone or the researcher writes his answers.

This pilot study was performed among 358 people attended outpatient clinics in seven areas of our Municipality, from March to June 2014. They were selected via systematic random sampling based on age and place of residence, according to the population of the seven areas of our Municipality. Informed consent was signed prior to enrollment into the study, under the instructions posed by the Ethical and Scientific Committee of our Hospital. All of them were given a set of the two questionnaires to be completed within 20 minutes during an interview and under the guidance of a Specialist Doctor (Internist or Family Doctor).

In our study, Body Mass Index (BMI) and Waist Circumference (WC) were identified from the anthropometric data measured by trained personnel. Weight and height were measured with light clothing and no shoes with the use of calibrated scales and wall-mounted stadiometers with the participants standing erect. Waist Circumference was measured in the midway of the lower rib and iliac crest using a tape.

Daily physical activity time was calculated as the sum of the minutes spent on physical activity for recreation, commuting and work for each day. The frequency of vegetables, fruits consumption was initially collected through 24-hour food recall, and only those who consumed vegetables or fruits at least 100 grams/day were considered as consuming them every day. The answers to all the questions of the FINDRISC were identified via self-reported answers given to trained junior doctors of our research team.

A score >15 categorizes a person at high risk for DM development for the next decade.

4. Results

We have found 75 persons (20,95%) with score >15.Mean age:52,14 years and mean BMI: 27,43kg/m. Our results are depicted on the following table:

Table 2. Distribution of Test Risk Scoring in Correlation with the Gender:

SCORE	< 7	7-11	12-14	15-20	>20
MEN N=145	42 (28.96%)	61 (42.08%)	21 (14.48%)	16 (11.03%)	5 (3.45%)
WOMEN N=213	48 (22.54%)	68 (31.92%)	43 (20.19%)	42 (19.72%)	12 (5.63%)
TOTAL N=358	90 (25.14%)	129 (36.03%)	64 (17.88%)	58 (16.20%)	17 (4.75%)

Unfortunately, regarding the knowledge attitude and perception questionnaire for cardiovascular risks factors, we had missing data for a variety of reasons as 95 questionnaires were excluded from the study (omission of signing the Informed consent form prior to enrollment into the study, some of the questionnaires were filled in after a second visit of the same person, some of the questionnaires were not filled in with the presence and guidance of a specialist medical doctor).

Accordingly, the knowledge of the persons included in the study about health risk factors: >90% knew the significance of high blood cholesterol, Diabetes, bad diet, exercise, smoking, obesity and hypertension, but over 60 % underestimated their exact mortality impact on cardiovascular events.

The average knowledge about cardiovascular risk factors was very good in general. (These are depicted on the following tables 3 and 4).

Positive correlation was found between educational years, profession, employment and the degree of risk factor knowledge with clear under evaluation of the true burden of smoking, lack of exercise and obesity from the lower socio-economy level participants. Positive correlation was also found between age, marital status, number of kids, educational years, profession, employment and their attitude/ perceptions about Prevention. All the above are shown on the following tables of ANOVA statistical analyses for the above mentioned variables. (tables 5-12)

Table 3. General Knowledge of Health Risk Factors Impact on Cardiovascular Events

	NO	SMALL	MODERATE	BIG	VERY BIG
HIGH BLOOD LDL CHOLESTEROL	4.5%	2.3%	3.0%	73.6%	15.8%
LOW BLOOD HDL COLESTEROL	61.5%	3.8%	8.3%	17.7%	8.7%
HIGH BLOOD SUGAR	3.4%	1.5%	3.4%	72.8%	18.1%
HIGH BLOOD PRESSURE	2.3%	1.1%	1.9%	72.1%	21.5%

We have found that the general knowledge of health risk factors impact on cardiovascular events, except of that of low blood HDL value, was excellent (>90%).

Table 4. Specific Knowledge of Cardiovascular Health Risk Factors Impact Importance

	NO	SMALL	MODERATE	BIG	VERY BIG
ARTERIAL HYPERTENSION	0.0%	0.0%	2.3%	81.9%	15.8%
DIABETES MELITUS	0.4%	0.0%	3.0%	76.6%	19.6%
DYSLIPIDEMIA	0.0%	1.9%	7.2%	78.5%	12.1%
BAD DIET	0.0%	2.3%	9.8%	76.2%	11.3%
SMOKING	0.4%	0.0%	3.0%	71.3%	25.3%
OBESITY	0.4%	0.4%	3.4%	74.3%	21.5%
ANXIETY	0.4%	0.0%	5.7%	55.5%	38.5%
LACK OF REGULAR EXERCISE	0.4%	4.5%	12.1%	77.0%	5.7%

We have found that the specific knowledge of cardiovascular health risk factors was very satisfactory (88% and over) for the studied factors

Table 5. Impact of Age and BMI

		AGE	BMI	ATTITUDE/ PERCEPTIONS ON PREVENTION	LEVEL OF RISK FACTORS KNOWLEDGE
AGE	Pearson Correlation	1	.041	-.371**	-.067
	Sig. (2-tailed)		.507	.000	.276
	N	265	265	265	265
BMI	Pearson Correlation	.041	1	-.074	.011
	Sig. (2-tailed)	.507		.228	.862
	N	265	265	265	265
ATTITUDE/ PERCEPTIONS ON PREVENTION	Pearson Correlation	-.371**	-.074	1	.007
	Sig. (2-tailed)	.000	.228		.905
	N	265	265	265	265
LEVEL OF RISK FACTORS KNOWLEDGE	Pearson Correlation	-.067	.011	.007	1
	Sig. (2-tailed)	.276	.862	.905	
	N	265	265	265	265
	Sig. (2-tailed)	.478	.407	.012	.000
	N	264	264	264	264

Our findings suggest the impact of age on the variable <<Attitude /perceptions on prevention >> ($r=-0.371$, $p<0.001$),but not any impact of BMI on the variables under evaluation.

Table 6. Impact of Marital Status

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/ PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	6.421	4	1.605	2.009	.094
	Within Groups		207.714	260	.799		
	Total		214.136	264			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	.236	4	.059	.537	.709
	Within Groups		28.515	260	.110		
	Total		28.750	264			
	Within Groups		126.014	259	.487		
	Total		126.818	263			

The high value of F combined with the value of $p=0.094$ show a strong statistical tendency, regarding the impact of marital status on the variable <<Attitude/Perceptions on prevention>>. (A larger sample would surely give a clearer statistical result).

Table 7. Impact of Number of Kids

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/ PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	9.566	6	1.594	2.011	.065
	Within Groups		204.569	258	.793		
	Total		214.136	264			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	1.036	6	.173	1.607	.145
	Within Groups		27.715	258	.107		
	Total		28.750	264			
	Within Groups		122.873	257	.478		
	Total		126.818	263			

The high value of $F=2.011$ combined with the value of $p=0.065$ show a strong statistical tendency, regarding the impact of the number of kids on <<Attitude/Perceptions on prevention>>.

Table 8. Impact of Education

EDUCATION	ATTITUDE /PERCEPTIONS ON PREVENTION	LEVEL OF RISK FACTORS KNOWLEDGE
NO FORMAL SCHOOLING	3.6667	4.0903
PRIMARY SCHOOL (GRADE : 1-6)	3.4074	4.0804
SECONDARY SCHOOL (GRADE :7-9)	3.5095	4.0292
SECONDARY SCHOOL (GRADE :10-12)	3.6331	4.0540
HIGHER SECONDARY	3.5952	4.1736
BACHELOR DEGREE	3.8354	4.1576
MSC,PHD HOLDER	4.1964	4.5000
Total	3.5849	4.1033

ANOVA Table							
IMPACT OF EDUCATION			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/ PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	9.457	6	1.576	1.987	.068
	Within Groups		204.678	258	.793		
	Total		214.136	264			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	1.811	6	.302	2.891	.010
	Within Groups		26.939	258	.104		
	Total		28.750	264			
	Within Groups		123.751	257	.482		
	Total		126.818	263			

There is an impact of education as a statistical tendency on the variable <<Attitude/perceptions on prevention>> and a clear impact on the variable <<Level of risk factors knowledge>>. (F=2.891, p=0.010).

Table 9. Impact of Major Occupation

MAJOR OCCUPATION	ATTITUDE/PERCEPTIONS ON PREVENTION	LEVEL OF RISK FACTORS KNOWLEDGE
SERVICE	3.9265	4.1602
UNEMPLOYED	4.0357	3.8125
HOUSEWIFE/UNABLE TO WORK	3.4662	4.0526
RETIRED	3.3143	4.0802
Total	3.5849	4.1033

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	22.155	3	7.385	10.040	.000
	Within Groups		191.981	261	.736		
	Total		214.136	264			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	.833	3	.278	2.597	.053
	Within Groups		27.917	261	.107		
	Total		28.750	264			
	Within Groups		125.411	260	.482		
	Total		126.818	263			

The impact of occupation on the variable <<Attitude/perceptions on prevention >> is statistically clear (F=10.040 and p<0.001).The impact of occupation on the variable <<Level of risk factor knowledge >> is very close to statistical significance (F=2.597 and p=0.053) which is certain with a larger sample size.

Table 10. Impact of Profession

PROFESSION	ATTITUDE/PERCEPTIONS ON PREVENTION	LEVEL OF RISK FACTORS KNOWLEDGE
SENIOR EXECUTIVES	3.6250	4.3125
SELF-EMPLOYED	3.6645	4.1288
TECHNICIANS	3.3247	4.0341
SERVICE PRIVATE	3.9500	4.2375
SALESMEN	3.8571	4.0500
AGRICULTURE SPECIALIZED	3.4556	4.0529
CERTIFIED TECHNICIANS	2.8571	4.5000
NON CERTIFIED TECHNICIANS	4.0357	4.1875
Total	3.5850	4.1115

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	11.317	8	1.415	1.762	.086
	Within Groups		179.008	223	.803		
	Total		190.325	231			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	1.818	8	.227	2.114	.036
	Within Groups		23.968	223	.107		
	Total		25.786	231			
	Within Groups		100.304	222	.452		
	Total		109.249	230			

There is a strong statistical tendency (F==1.762, p=0.086) for the impact of profession on the variable <<Attitude/perception on prevention>>. Its impact on the variable <<Level of risk factors knowledge >> is statistically significant.

Table 11. Impact of Cigarette Smoking

CIGARETTE SMOKING (NUMBER OF SIGARETTES)	ATTITUDE/PERCEPTIONS ON PREVENTION	LEVEL OF RISK FACTORS KNOWLEDGE
NONE	3.5326	4.1124
< 5	3.9048	3.9861
6-10	4.2041	4.0536
10-20	3.9286	4.0804
> 20	3.5714	4.0536
Total	3.5849	4.1033

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	5.883	4	1.471	1.836	.122
	Within Groups		208.252	260	.801		
	Total		214.136	264			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	.184	4	.046	.420	.794
	Within Groups		28.566	260	.110		
	Total		28.750	264			
	Within Groups		121.648	259	.470		
	Total		126.818	263			

There is no impact of smoking on the variables <<Attitude/perception on prevention>>and <<Level of risk factors knowledge >>

Table 12. Impact of Income

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
ATTITUDE/PERCEPTIONS ON PREVENTION	Between Groups	(Combined)	9.203	7	1.315	1.645	.123
	Within Groups		204.589	256	.799		
	Total		213.792	263			
LEVEL OF RISK FACTORS KNOWLEDGE	Between Groups	(Combined)	.586	7	.084	.764	.618
	Within Groups		28.090	256	.110		
	Total		28.676	263			
	Within Groups		121.017	255	.475		
	Total		126.779	262			

There was no impact of the income on the two variables we have studied.

5. Discussion

Cardiovascular disease shares several risk factors with type 2 diabetes. The Finnish Diabetes Risk Score (FINDRISC) is a reasonably good predictor of CHD, stroke and total mortality. The areas under the ROC curves (AUC) were 71% for CHD, 73% for stroke, and 68% for total mortality in men and 78,68, and 72% in women, respectively. The addition of systolic and diastolic blood pressures, total and high-density lipoprotein cholesterol, and smoking increased the AUC values modestly (the change of the absolute values from 2.6 to 6.5%), but the additional use of plasma glucose had only a slight effect on the AUC values for CHD and stroke.[46]

Population testing of blood glucose to determine CV risk is not recommended, due to the lack of affirmative evidence that the prognosis of CVD related to T2DM can be improved by early detection and treatment. [20, 21] Screening of hyperglycaemia for CV risk purposes should therefore be targeted to high-risk individuals. The Anglo-Danish-Dutch Study of Intensive Treatment in People with Screen Detected Diabetes in Primary Care (ADDITION) study provided evidence that the risk of CVD events is low in screen-detected people with T2DM. Screening may, however, facilitate CV risk reduction and early detection may benefit progression of microvascular disease, which may make screening for T2DM beneficial. [22]

In addition, there is an interest in identifying people with IGT, since most will progress to T2DM and this progression can be retarded by lifestyle interventions. [23-27]

The diagnosis of DM has traditionally been based on the level of blood glucose that relates to a risk of developing micro- rather than macrovascular disease. The DETECT-2 study analysed results from 44 000 persons in nine studies across five countries. [18]

It was concluded that a HbA1c of 6.5% (48 mmol/L) and an FPG of.6.5 mmol/L (117 mg/dL) together gave a better discrimination in relation to the view—adopted by the ADA and WHO—that, for general population, screening an HbA1c .6.5% is diagnostic of DM, but between 6.0–6.5%, an FPG needs to be measured to establish a diagnosis. [3, 4]

Caveats exist in relation to this position, as extensively reviewed by Hare et al. Problems exist in relation to pregnancy, polycystic ovary syndrome, haemoglobinopathies and acute illness mitigating against its use under such circumstances.[28,29]

Moreover, the probability of a false negative test result, compared with the OGTT, is substantial when attempting to detect DM by measuring only FPG and/or HbA1c in an Asian population. [30]

A study in Spanish people with high risk, i.e..12/26 points in the Finnish Diabetes Risk Score (FINDRISC) study, revealed that 8.6% had undiagnosed T2DM by the OGTT, whilst only 1.4% had an HbA1c 6.5%, indicating a further need to evaluate the use of HbA1c as the primary diagnostic test in specific populations. [6]

There remains controversy regarding the approach of using HbA1c for detecting undiagnosed DM in the setting of coronary heart disease and CV risk management, although advocates argue that HbA1c in the range 6.0–6.5% requires lifestyle advice and individual risk factor management alone, and that further information on 2hPG does not alter such management.[4–7], [28]

The approaches for early detection of T2DM and other disorders of glucose metabolism are:

(i) measuring PGorHbA1c to explicitly determine prevalent T2DM and impaired glucose regulation;
(ii) using demographic and clinical characteristics and previous laboratory tests to determine the likelihood for T2DM and
(iii) collecting questionnaire-based information that provides information on the presence of aetiological risk factors for T2DM. The last two approaches leave the current glycaemic state ambiguous and glycaemia testing is necessary in all three approaches, to accurately define whether T2DM and other disorders of glucose metabolism exist.

However, the results from such a simple first-level screening can markedly reduce the numbers who need to be referred for further testing of glycaemia and other CVD risk factors. Option two is particularly suited to those with pre-existing CVD and women with previous gestational DM, while the third option is better suited to the general population and also for overweight/obese people.

Several DM risk scores for DM have been developed. Most perform well and it does not matter which one is used, as underlined by a recent systematic review. The Finnish Diabetes Risk Score is the most commonly used to screen for DM risk in Europe. [31]

This tool, available in almost all European languages, predicts the 10-year risk of T2DM—including asymptomatic DM and IGT-with 85% accuracy. It has been validated in most European populations. [32, 33]

It is necessary to separate individuals into three different scenarios:

(i) the general population;
(ii) people with assumed abnormalities (e.g. obese, hypertensive, or with a family history of DM) and
(iii) patients with prevalent CVD. In the general population and people with assumed abnormalities, the appropriate screening strategy is to start with a DM risk score and to investigate individuals with a high value with an OGTT or a combination of HbA1c and FPG. [32,33]

In CVD patients, no diabetes risk score is needed but an OGTT is indicated if HbA1c and/or FPG are inconclusive, since people belonging to these groups may often have DM revealed only by an elevated 2hPG.[34-37]

In many countries of the world (E.U., U.S.A., ASIA) high prevalence of major risk factors like smoking, bad

dietary habits, lack of exercise, alcohol, obesity, arterial hypertension was reported. Recent studies proved that in the U.S.A. and Canada the level of knowledge of health risk factors was very good, but, there was an insufficient knowledge about healthy diet. Those studies showed that both the high level of education and income were protective against the prevalence of health risk factors, morbidity and mortality from all causes, compared to the people with lower income and education.[49-51] Studies in Greece proved that a lot of Greeks don't follow the Mediterranean type of diet (54.7 %) and there was a relatively lower level of knowledge of the cardiovascular risk factors for those with a lower education level and those residing in Attica-Athens who were following in a lower percentage the healthier Mediterranean style of diet. [47, 48]

Our study revealed that despite the low level of education of many participants (elementary school graduates) in a percentage more than >90% they were aware of the cardiovascular impact of high blood cholesterol, glucose, arterial hypertension but over 60 % underestimated their exact mortality impact on cardiovascular events.

Nevertheless a lot (even those with higher level of education) ignore that low levels of HDL cholesterol are hazardous for cardiovascular health. In general, they knew the impact of bad diet, smoking, obesity, anxiety, and lack of exercise on cardiovascular events regardless of age, sex and educational level. But the specification of the questions revealed lack of knowledge especially for the correlation of smoking and cardiovascular events (even between higher education persons in a lesser degree). Positive correlation was also found among age, marital status, number of kids, educational years, profession, employment and their attitude/ perceptions about prevention.

6. Conclusions

Face-to-face interactions between patients and doctors have been identified as the << heart of medicine >> [41] Also, legislation has been enacted in some US States requiring hospitals and health service providers to have patient and family advisory councils [42].

In line with the aforementioned, organizational health literacy has gained importance in WHO documents and elsewhere in order to facilitate patient-doctor engagement, especially as it pertains to patient information and communications [39],[43,44].

Hospitals and health services should recognize and promote the essential role and centrality of patients, families and citizens in driving the improvement of quality and outcomes of healthcare systems[38].

Although public awareness and health risk factors knowledge is growing, there are gaps in the field of person oriented methodology approach for enhanced health literacy. We need the development of targeted intervention programmes which address the general population in order to change the culture of hospital. This study is the first in our municipality to explore extensively the level of cardiovascular risk factors knowledge, attitude/perceptions on prevention and their association with demographic socioeconomic data towards a health-literated approach.

In our area this pilot study, showed that the burden of the problem for future development of T2D is probably high and there is the need to think globally but act locally towards interdisciplinary working, transparent decision-making and active health-literated involvement of patients.

We know that change happens because people push to make it happen. We've got to do the hard work of educating others, showing empathy to them, changing hearts and minds. And when we do that, then change occurs. It doesn't come always as quickly as we would like, but, eventually progress comes, despite the socio-economy setbacks.

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