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Knowledge and practice related to gestational diabetes among primary health care providers in Morocco: Potential for a defragmentation of care?

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ABSTRACT

Introduction: The objective of this study was to assess knowledge and practices of general practitioners, nurses and midwives working at primary health care facilities in Morocco regarding screening and management of gestational diabetes (GDM).

Methods: Structured interviews with 100 doctors, midwives and nurses at 44 randomly selected public health care centers were conducted in Marrakech and Al Haouz. All data were descriptively analyzed. Ethical approval for the study was granted by the institutional review boards in Belgium and Morocco.

Results: Public primary health care providers have a basic understanding of gestational diabetes but screening and management practices are not uniform. Although 56.8% of the doctors had some pre-service training on gestational diabetes, most nurses and midwives lack such training. After diagnosing GDM, 88.5% of providers refer patients to specialists, only 11.5% treat them as outpatients.

Discussion: Updating knowledge and skills of providers through both pre- and in-service-training needs to be supported by uniform national standards enabling first line health care workers to manage women with GDM and thus increase access and provide a continuity in care. Findings of this study will be used to pilot a model of GDM screening and initial management through the primary level of care.

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1. Introduction

The number of pregnant women affected by gestational diabetes (GDM) is increasing globally with an estimated prevalence as high as 15% according to the latest figures [1]. Previous studies from Morocco revealed that eight to ten out of 100 pregnancies are affected by GDM [2,3]. GDM is neither painful nor debilitating, but is associated with birth complications, and affected women have a seven times higher risk of developing type 2 diabetes later in life [4].

In Morocco, where antenatal care (ANC) attendance is as high as 77.1% [5], first level health care providers, particularly nurses and midwives, are usually the first point of contact for pregnant women. Fasting glucose testing in the first and the second trimester form part of the Moroccan ANC recommendations [6] and currently three national guidelines containing GDM recommendations are available [7–9]. However, their information is not always congruent. Some national guidelines suggest selective screening while others recommend universal screening. National guidelines suggest the screening of women with risk factors such as, a history of GDM, diabetes of a family member, overweight, advanced age (35 years or older), repeated urinary tract infections, macrosomia, intrauterine fetal or neonatal death, malformation or more than two abortions with a glucose challenge and/or oral glucose tolerance test at a gestational age of between 24 and 28 weeks [7–9]. According to best practice recommendations [8], insulin should be prescribed if glucose values are not stable within seven to ten days of dietary measures. Self-monitoring of glucose several times a day is the recommended testing method and a monthly follow up of affected women whose GDM is well balanced, is suggested. Cesarean section is only indicated when a birthweight of 4500 g or more is estimated at a gestational age of 39 weeks. Re-testing by fasting glucose is proposed for the third postnatal care visit which usually takes place six weeks postpartum [8].

Given the specific role of primary health care providers as the first point of contact for pregnant women, our objective was to assess the knowledge and current practices of general practitioners, nurses and midwives working at primary health care facilities. The results are anticipated to draw increased attention to their potential but also their limitations in GDM management. The findings are also expected to contribute to the development of future strategies that focus on strengthening the primary health care level, thus improving access to GDM screening, management and follow-up.

2. Methodology

As part of a broader situational analysis of gestational diabetes in Morocco, we assessed knowledge and practice of health care professionals providing maternal health services in the provinces of Marrakech and Al Haouz. This paper describes the knowledge and practices of three professional groups including general practitioners, nurses and midwives working at the health center level ($n = 100$). Six trained local data collectors approached health care providers in 44 randomly selected public health centers of which 24 were located in Marrakech

and 20 in Al Haouz. Providers who were present on the day of our visit and agreed to participate in the assessment were interviewed using a structured interview guide including a mix of 37 multiple choice and open-ended questions. The multiple choice questions were related to general knowledge about GDM and experience with affected patients. We also assessed providers' knowledge about screening (who, when and how to screen) and management practices, and asked for information about previous training on GDM. Each interview took between 15 to 25 min and respondents could freely decide to answer or not to answer a question.

Data was entered into a pre-formatted EXCEL spreadsheet and open-ended responses were transformed into categorical or continuous variables. After conversion into STATA software, Version IC13, data was descriptively analyzed with calculation of means and standard errors of normally distributed continuous variables, median and interquartile range of the non-normally distributed variables. Categorical variables were summarized as counts and percentages with their distributions between two groups being compared using Chi-square or Fisher's exact test.

The reported findings have been collected as part of a situational analysis on gestational diabetes conducted in two districts of Morocco for which ethical approval has been granted by the institutional review boards of the Institute of Tropical Medicine (ITM) and the Ethics Committee of the University of Antwerp (UZA), Belgium and the institutional review board of the Mohammed V University, Rabat, Morocco.

3. Results

3.1. Sociodemographic characteristics

All of the general practitioners, nurses and midwives approached, agreed to participate in the survey. Of the 100 health care providers interviewed, 39% of respondents were general practitioners, 32% nurses and 29% midwives. Around 80.6% (79) of interviewees were female and 19.4% (19) were male. Nearly half of the doctors (48.6%) were men whereas most of the nurses and midwives were women (98.4%). Respondents were on average 43 years old and their median length of employment in the current job was eight years. The distribution of health care providers between urban and rural health centers was balanced although most of the doctors worked in urban centers whereas more nursing professionals were located in rural centers (Table 1).

Although most respondents replied to questions related to general knowledge about GDM and screening for GDM, only a few respondents could provide answers related to the management of patients affected by GDM. The number of respondents who replied to each question is provided in the respective tables. No major differences in replies were found between doctors and nurses, except for training in GDM and medical treatment of GDM.

3.2. General knowledge and training

All providers stated they had heard about gestational diabetes (GDM) and 89% described it correctly as a form of diabetes

Table 1 – Socio-demographic characteristics of respondents.

Socio-demographics	All	Medical practitioners	Nursing professionals	p-Value
Age (years)				
Mean (SD); n	43 (10.3); 99	46 (8.2); 38	42 (11.2); 61	
Sex				
Female, n (%)	79 (80.6)	19 (51.4)	Female 60 (98.4)	
Male, n (%)	19 (19.4)	18 (48.6)	Male 1 (1.6)	
In service (years)				
Median (IQR ^a); n	15 (10–23); 96	16 (10–23); 37	15 (10–24); 59	
In current position (years)				
Median (IQR ^a); n	8 (3–14); 90	7 (2–14.5); 36	8 (3–14); 54	
Workplace type				
Health center with maternity, n (%)	47 (47)	17 (43.6)	30 (49.2)	
Health center without maternity, n (%)	53 (53)	22 (56.4)	31 (50.8)	0.733
Workplace location				
Urban, n (%)	51 (51)	22 (56.4)	29 (47.5)	
Rural, n (%)	49 (49)	17 (43.6)	32 (52.5)	0.387

^a IQR: inter quartile range.

occurring during pregnancy. Most of the respondents (87.9%) had previously encountered women affected by GDM. The majority of providers stated that GDM occurred during pregnancy without specifying a time period (77.7%; 66) while 22.4% (19) indicated that GDM would start later in pregnancy, either in the second or even in the third trimester.

Of 96 respondents, 95.8% of health care professionals (92) mentioned GDM related complications with macrosomia being the leading complication (76% of all respondents; 91.9% of doctors and 65.5% of nurses and midwives; $p = 0.007$) (Fig. 1).

Only 36.1% of 97 health care workers who answered the question related to training stated their pre-service training included aspects on GDM. Overall, 56.8% (21) of doctors reported being taught about GDM during their studies whereas only 23.3% (14) of the nurses and midwives stated they did receive any pre-service training on GDM (Table 2).

3.3. Screening

Most providers (98%) perceived the necessity of screening pregnant women for GDM. Of 93 respondents, the majority (69.9%) stated that all pregnant women should be tested (universal screening) and one third of providers (30.1%) said that only women with risk factors should be screened. The three leading risk factors named by 86 respondents were, overweight with a body mass index (BMI) of 25 kg/m² or above (69.8%), diabetes in the family (62.8%) or a previous history of GDM (58.1%) (Fig. 2).

The timing of screening was reported by 92 providers. More than half of them (53.3%; 49) indicated that GDM detection should take place in the second trimester and one third of respondents (30.4%; 28) stated screening is indicated in the first trimester of the pregnancy or at the first contact with the woman. Fasting glucose as screening test was mentioned by 90.9% of the 99 providers who answered the question on tests. Half of the respondents (50.5%) indicated that testing of urine is used for screening with the majority being nursing professionals (58.3%; 35) as compared to 38.5% (15) of the doctors. A glucose challenge or tolerance test was only mentioned by 11.1% (11) of health care workers. Three quarters of 91 respondents who clarified the type of blood used for screening named

venous blood samples (75.8%; 69) and 44% (40) named capillary samples. Glucose thresholds for the diagnosis of GDM were not specifically asked in the questionnaire but in open ended questions regarding the definition of GDM, 14% (14) of the providers indicated fasting glucose levels ranging between 0.92 g/l and 2 g/l (mean 1,2 g/l, SD 0,26).

According to 97 health care providers, screening is generally performed in three types of environments, in health centers (56.7% of providers), referral hospitals (55.7%) and in private laboratories (57.7%); the latter were named specifically by the doctors (70.3%) (Table 3).

3.4. Management

Information on the place of management after diagnosis was provided by 96 health care professionals. The majority of respondents refer women after diagnosis of GDM (88.5%; 85). Nurses and midwives refer either to the general practitioner of their health center (43.8%; 14) or to a specialist (46.9%; 15) and most general practitioners send affected women to an endocrinologist or a gynecologist (90%; 18) (Table 4).

Information on follow up was provided by 75 respondents with the majority of them indicating that women with GDM are followed-up monthly (70.7%). Intervals for glucose testing were specified by 65 providers with 60% of them stating that glucose levels should be checked on a daily basis. The place of glucose control was reported by 81 respondents; 44.4% (36) indicated that glucose is controlled at the facility level and 32.1% (26) said patients would self-monitor their blood sugar levels. This last option was mentioned by 45.2% (14) of the doctors. A quarter of the providers (23.1%; 19) reported that patients have their blood glucose tested at private laboratories.

About half of the health care providers (44) answered the question regarding the interval between diagnosis and initiation of medication. Most respondents stated that sugar levels are generally controlled for a period of between two and four weeks before medication is started (63.7%; 28) although 19% of the doctors (4) reported starting medical treatment immediately after diagnosing GDM. Information on medication was provided by 81 health professionals. Insulin was listed as the drug of choice for the medical treatment of GDM by 63% (51)

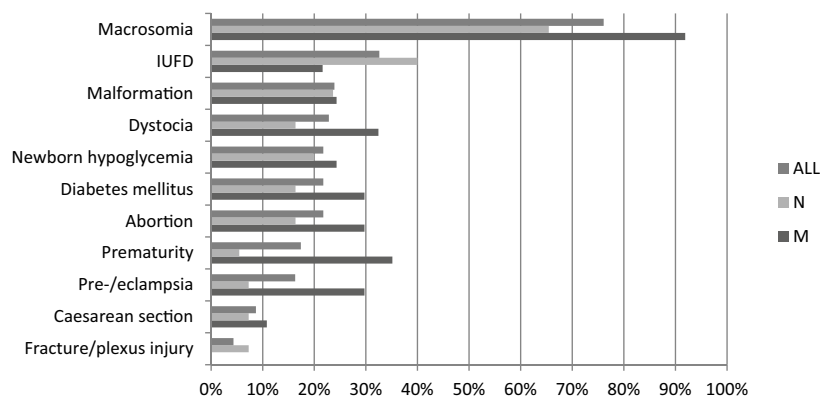


Fig. 1 – Frequency distribution of GDM associated complications (stratified by respondent profession) (M: Medical practitioners, N: Nursing professionals).

Table 2 – General knowledge and training related to gestational diabetes (GDM).

General knowledge and training	All	Medical practitioners	Nursing professionals	p-Value
Had heard of GDM				
Yes, n (%)	100 (100)	39 (100)	61 (100)	
No, n (%)	–	–	–	
Correct description of GDM				
Yes, n (%)	89 (89)	36 (92.3)	53 (86.9)	
No, n (%)	11 (11)	3 (7.7)	8 (13.1)	0.398
Occurrence of GDM				
During pregnancy, n (%)	66 (77.7)	29 (82.9)	37 (74)	
Second trimester, n (%)	9 (10.6)	2 (5.7)	7 (14)	
Between 24–28 weeks, n (%)	9 (10.6)	4 (11.4)	5 (10)	
Third trimester, n (%)	1 (1.2)	–	1 (2)	0.516
Had contact with GDM patients				
Yes, n (%)	87 (87.9)	36 (92.3)	51 (85)	
No, n (%)	12 (12.1)	3 (7.7)	9 (15)	0.276
GDM causing complications				
Yes, n (%)	92 (95.8)	37 (97.4)	55 (94.8)	
No, n (%)	4 (4.2)	1 (2.6)	3 (5.2)	0.542
Training during studies				
Yes, n (%)	35 (36.1)	21 (56.8)	4 (23.3)	
No, n (%)	62 (63.9)	16 (43.2)	46 (76.7)	0.001
Training on-the-job				
Yes, n (%)	10 (10.2)	8 (21.6)	2 (3.3)	
No, n (%)	88 (89.8)	29 (78.4)	59 (96.7)	0.004

of the providers. The majority of nurses and midwives did not mention a specific drug and stated that treatment would depend on medical advice or that it required referral (57.8%; 26).

3.5. Delivery and the post-partum

The timing of the delivery was indicated by 68 health professionals. Three quarters of them (75%; 51) reported delivering a woman with GDM at term. The mode of delivery was specified by 79 providers of whom 38% (30), the majority nurses and midwives (46.9%; 23), indicated primary cesarean section as the appropriate mode of delivery. Vaginal delivery was the preferred way of giving birth for 34.3% (27) of all respondents, for 36.7% (11) of the general practitioners and for 32.7% (16) of the nurses and midwives.

About half of the respondents (52) provided information on newborn glucose testing after delivery. 59.6% (31) of them

reported they routinely control blood sugar levels of newborns of GDM affected mothers after birth. Of 66 health care providers who informed about re-testing for diabetes, 89.4% (59) indicated they re-test women who had GDM post-partum, the majority by measuring fasting glucose levels (Table 5).

4. Discussion

The assessment of knowledge and current practices of doctors and nursing professionals at first level health care services in Morocco was part of a comprehensive study of gestational diabetes screening and management in Morocco [10]. As part of this situational analysis, the provider survey revealed that primary health care providers, both nurses and doctors possess a basic knowledge about gestational diabetes, and most of them have had contact with women affected by GDM. Although our survey covered the entire range from general knowledge about GDM to actual management and screening practices, in the

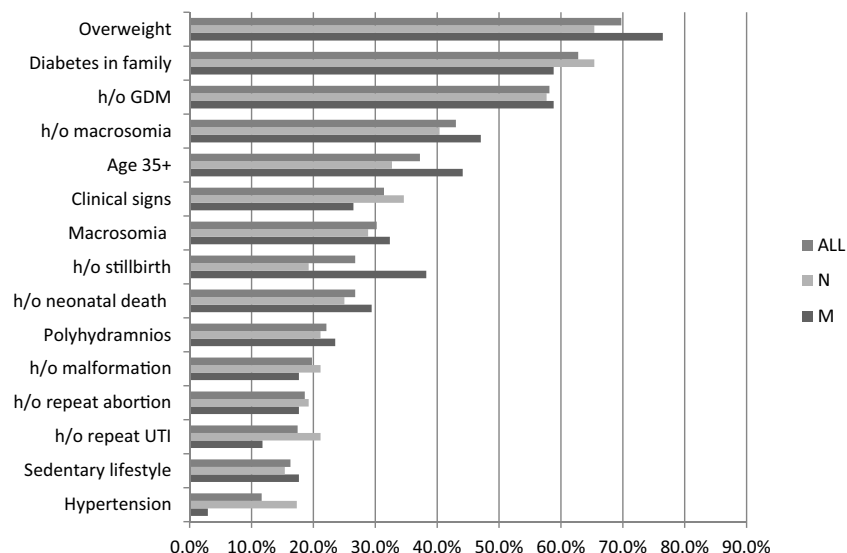


Fig. 2 – Frequency distribution of GDM associated risk factors (stratified by respondent profession).

Table 3 – Screening.

Screening	All	Medical practitioners	Nursing professionals	p-Value
Screening perceived as necessary				
Yes, n (%)	98 (98)	38 (97.4)	60 (98.4)	
No, n (%)	2 (2)	1 (2.6)	1 (1.6)	0.747
Type of screening				
Universal, n (%)	65 (69.9)	24 (64.9)	41 (73.2)	
Selective, n (%)	28 (30.1)	13 (35.1)	15 (26.8)	0.390
Mentioning risk factors				
Yes, n (%)	86 (86)	34 (87.2)	52 (85.3)	
No, n (%)	14 (14)	5 (12.8)	9 (14.8)	0.786
Timing of screening				
First trimester, n (%)	22 (23.9)	11 (29.7)	11 (20)	
First contact, n (%)	6 (6.5)	–	6 (10.9)	
First and/or second trimester, n (%)	11 (12)	6 (16.2)	5 (9.1)	
Second trimester, n (%)	33 (35.9)	14 (37.8)	19 (34.6)	
24–28 weeks, n (%)	16 (17.4)	4 (10.8)	12 (21.8)	
Other, n (%)	4 (4.3)	2 (5.4)	2 (3.6)	0.179
Screening tests ^a				
Fasting blood sugar, n (%)	91 (90.9)	37 (94.9)	54 (90)	
Urine test, n (%)	50 (50.5)	15 (38.5)	35 (58.3)	
Hb1AC, n (%)	12 (12.1)	5 (12.8)	7 (11.7)	
Oral glucose challenge/tolerance test, n (%)	11 (11.1)	8 (20.5)	3 (5)	
Random blood sugar, n (%)	1 (1)	–	1 (1.7)	
Place of screening ^a				
Health center, n (%)	55 (56.7)	20 (54.1)	35 (58.3)	
Referral hospital, n (%)	54 (55.7)	24 (64.9)	30 (50)	
Private laboratory, n (%)	56 (57.7)	26 (70.3)	30 (50)	
Other, n (%)	7 (7.2)	3 (8.1)	4 (6.7)	
Method of drawing blood for screening ^a				
Venous, n (%)	69 (75.8)	26 (78.8)	43 (74.1)	
Capillary, n (%)	40 (44)	13 (39.4)	27 (46.6)	
Urine, n (%)	22 (24.2)	4 (12.1)	18 (31)	
Information about fasting glucose thresholds for GDM diagnosis (g/l)				
Mean (SD); n	1.2 (0.26); 14	1.28 (0.33); 7	1.13 (0.16); 7	

^a Multiple answers possible.

following section we will place the findings in relation to the continuity of care through first level health care providers.

Few of the interviewed health professionals have been trained with regards to gestational diabetes in their pre-

service period and even fewer while already on the job. Nurses and midwives in particular lacked training on GDM although they represent the first point of contact for pregnant women through antenatal care and their involvement is key to achiev-

Table 4 – Management.

Management	All	Medical practitioners	Nursing professionals	p-Value
Management after GDM diagnosis				
Referral, n (%)	85 (88.5)	33 (89.2)	52 (88.1)	
Outpatient, n (%)	11 (11.5)	4 (10.8)	7 (11.9)	0.875
Referral to				
Endocrinologist, n (%)	19 (36.5)	9 (45)	10 (31.3)	
Medical doctor (at health center), n (%)	14 (26.9)	–	14 (43.8)	
Gynecologist, n (%)	6 (11.5)	2 (10)	4 (12.5)	
Endocrinologist and gynecologist, n (%)	3 (5.8)	3 (15)	–	
Specialist not further specified, n (%)	5 (9.6)	4 (20)	1 (3.1)	
Referral hospital, n (%)	5 (9.6)	2 (10)	3 (9.4)	0.003
Follow-up interval of affected women				
Weekly, n (%)	4 (5.3)	3 (9.7)	1 (2.3)	
Fortnightly, n (%)	9 (12)	5 (16.1)	4 (9.1)	
Monthly, n (%)	53 (70.7)	21 (67.7)	32 (72.7)	
During ANC, n (%)	4 (5.3)	1 (3.2)	3 (6.8)	
Medical advice, n (%)	4 (5.3)	1 (3.2)	3 (6.8)	
No follow-up, n (%)	1 (1.3)	–	1 (2.3)	0.511
Interval glucose controls				
Daily, n (%)	39 (60)	25 (83.3)	14 (40)	
Weekly, n (%)	7 (10.8)	–	7 (20)	
Monthly, n (%)	15 (23.1)	4 (13.3)	11 (31.4)	
Less than monthly, n (%)	4 (6.2)	1 (3.3)	3 (8.6)	0.003
Place glucose controls				
Medical facility, n (%)	36 (44.4)	13 (41.9)	23 (46)	
Private laboratory, n (%)	19 (23.5)	4 (12.9)	15 (30)	
At home by patient, n (%)	26 (32.1)	14 (45.2)	12 (24)	0.077
Initiation of medical treatment after diagnosis				
Immediately, n (%)	13.7% (6)	19% (4)	8.7% (2)	
After one week, n (%)	6.8% (3)	14.3% (3)	–	
After two weeks, n (%)	27.3% (12)	28.6% (6)	26.1% (6)	
After a month, n (%)	36.4% (16)	23.8% (5)	47.8% (11)	
Depend on blood sugar, n (%)	13.6% (6)	14.3% (3)	13% (3)	
Other (no treatment), n (%)	2.3% (1)	–	4.3% (1)	0.233
Type of medical treatment				
Insulin, n (%)	51 (63)	33 (91.7)	18 (40)	
Metformin, n (%)	1 (1.2)	–	1 (2.2)	
Refer/medical advice, n (%)	29 (35.8)	3 (8.3)	26 (57.8)	<0.001

ing a continuum of care [11]. A model of nurse led care for non-communicable diseases established at primary level facilities in South Africa resulted in an increase in treatment adherence when providers were supported by simple guidelines and management flowcharts [12]. Although this example does not include pregnant mothers, the management of mothers with uncomplicated GDM at the primary level by a close collaboration of all involved providers could reduce access barriers and improve follow-up, advantages also highlighted in a study from Ireland [13].

Regarding the place of screening, primary care providers indicated that screening is performed at health centers, private laboratories or at the referral hospital. Diabetes screening at the health center through the chronic disease program is possible for women with a previous history of gestational diabetes. However, all other pregnant women are sent for testing to an external laboratory where GDM screening is done using venous blood samples according to the national screening recommendations. The latest FIGO recommendations on GDM propose the use of capillary glucose testing with a plasma calibrated device for settings where an onsite laboratory does not exist [14]. This would render testing at primary care facilities

feasible and could reduce the risk of patient drop outs and delays.

There is a clear division between maternal health and non-communicable diseases and although general practitioners in Morocco are managing non-pregnant patients with diabetes, gestational diabetes is considered a high risk pregnancy and requires specialist care. Referral to a higher level implies additional costs for the women and may as a consequence increase the number lost to follow-up and drop out [15]. There is also a lack of specialists for diabetes care in many less developed settings [16]. This can limit access to specialized services and may imply treatment delays. Delay acts as a major barrier for timely interventions particularly as the window from being screened positive for GDM to delivery is very narrow. Referral for a condition that in 70–85% of cases can be successfully treated with diet only represents a waste of resources, time and money [17]. However, initiating management that starts with nutritional therapy through the local health center would require that primary health care workers are sufficiently trained to provide dietary advice and have clear instructions for when to refer the patient to a higher level of care.

Table 5 – Delivery and the post-partum.

Delivery and the post-partum	All	Medical practitioners	Nursing professionals	p-Value
Timing of delivery				
At term, n (%)	51 (75)	22 (84.6)	29 (69)	
Before 38 weeks, n (%)	7 (10.3)	1 (3.8)	6 (14.3)	
At 38–39 weeks, n (%)	7 (10.3)	3 (11.5)	4 (9.5)	
According to medical advice, n (%)	3 (4.4)	–	3 (7.1)	0.247
Mode of delivery				
Vaginal, n (%)	27 (34.2)	11 (36.7)	16 (32.7)	
C-section, n (%)	30 (38)	7 (23.3)	23 (46.9)	
C-section if complication/indication, n (%)	9 (11.4)	5 (16.7)	4 (8.2)	
Depends/medical advice, n (%)	13 (16.5)	7 (23.3)	6 (12.2)	0.145
Routine glucose control newborn after birth				
Yes, n (%)	31 (59.6)	12 (66.7)	19 (55.9)	
No, n (%)	21 (40.4)	6 (33.3)	15 (44.1)	0.451
Maternal glucose control immediate post-partum				
Yes, n (%)	46 (73)	21 (87.5)	25 (64.1)	
No, n (%)	17 (27)	3 (12.5)	14 (35.9)	0.042
Re-testing mother for diabetes post-partum period				
Yes, n (%)	59 (89.4)	26 (96.3)	33 (84.6)	
No, n (%)	7 (10.6)	1 (3.7)	6 (15.4)	0.130
Type of test for post-partum re-testing ^a				
Fasting blood sugar, n (%)	62 (91.2)	25 (86.2)	37 (94.9)	
HbA1C, n (%)	10 (14.7)	6 (20.7)	4 (10.3)	
Random blood sugar, n (%)	2 (2.9)	1 (3.4)	1 (2.6)	

^a Multiple answers possible.

Primary cesarean section was rated by first level providers as the preferred mode of delivery, particularly by nurses and midwives. This might be related both to their knowledge and previous experience of macrosomia being a complication of GDM. Although the GDM status of mothers who delivered a macrosomic baby is often unknown [18], the diagnosis of GDM might lead to a referral for a cesarean section which is in line with findings from Canada where GDM diagnosis favored the decision for an operative delivery [19].

Only 20% of interviewed health care providers mentioned an increased risk for GDM patients to later develop diabetes, whereas nearly 90% of the providers stated they would retest a mother for GDM in the post-partum period. With only 22% of mothers attending postnatal care (PNC) services [5], it remains questionable whether mothers with GDM are actually retested in their postnatal period. With low PNC attendance but high newborn vaccination coverage of 87.7% [5], linking postpartum testing for diabetes with vaccination of the infant would probably be the best option in Morocco. This is in line with latest international recommendations [14].

Although this is the first time that knowledge and practice of primary health care providers in Morocco in relation to GDM has been assessed, the results need to be handled with caution as some of the responses might be subject to desirability bias. To examine what practices are actually performed, a design including direct observation would have provided a more realistic presentation of the situation.

5. Conclusions

Primary level health care professionals possess basic knowledge about GDM and reported practices reflect to some extent the discrepancies in the existing national guidelines. There

seems to be potential that more GDM related services could be delivered through first line health workers given that national guidelines are reviewed for uniformity and adapted to the latest international evidence. With knowledge and skills of first line providers updated and strengthened, a decentralized approach through the PHC level would not only increase the clinical benefit for patients but could also optimize the efficiency of the healthcare system by ensuring a continuum of care for affected mothers and their newborns through their health care practitioners at the first level of care.

Conflict of interest

The authors state that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.pcd.2017.04.005>.

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