



# Evaluation of Training Program about Awareness of Gestational Diabetes Mellitus (GDM) among Health Care Workers of Ahmedabad Municipal Corporation

Shraddha Patel<sup>1</sup>, Sheetal Vyas<sup>2</sup>

**Financial Support:** None declared  
**Conflict of Interest:** None declared  
**Copy Right:** The Journal retains the copyrights of this article. However, reproduction of this article in the part or total in any form is permissible with due acknowledgement of the source.

#### How to cite this article:

Patel S, Vyas S. Evaluation of Training Program about Awareness of Gestational Diabetes Mellitus (GDM) among Health Care Workers of Ahmedabad Municipal Corporation. Natl J Community Medicine 2018; 9(2):114-119

#### Author's Affiliation:

<sup>1</sup>Second year resident, <sup>2</sup>Professor and Head, Dept of Community Medicine, AMC MET Medical College, Ahmedabad

#### Correspondence

Dr Sheetal Vyas  
dr\_shvyas@yahoo.com

**Date of Submission:** 08-12-17

**Date of Acceptance:** 02-02-18

**Date of Publication:** 28-02-18

## ABSTRACT

**Introduction:** In view of high prevalence of “Gestational Diabetes Mellitus (GDM)” in Indian population with inappropriate management, the training regarding GDM is very important for health care providers. The study conducted to know profile of Health care providers, their knowledge about GDM and its management of GDM and reassessment of knowledge after training program.

**Methods:** Total 400 health care providers of Ahmedabad Municipal Corporation who attended the GDM Training session were included in study. The health care providers included Accredited Social Health Activists (ASHA), Auxiliary Nurse Midwife etc. A predesigned and pretested proforma was used for pre and post training assessment of the knowledge of the participants.

**Results:** Before training 162(40.5%) participants could correctly tell about GDM which increased to 50% after training. Before training 21.25% participants could tell all effects of GDM on mother which increased to 55% after training. Knowledge of effect on new-born increased from 14% to 52.5%. There was significant increase in knowledge of participant in aspects of GDM namely test for diagnosis, gestational age which women should be tested, details about OGTT and timing after delivery when GDM women should be tested for blood sugar.

**Conclusion:** Knowledge about GDM is poor amongst health care providers and hence there is need for training.

**Key words:** Gestational Diabetes Mellitus, Oral Glucose Tolerance Test, , Medical Nutritional Therapy, Glucometer

## INTRODUCTION

Gestational Diabetes Mellitus (GDM) is a type of diabetes or glucose intolerance that has an onset or is first recognized during pregnancy. It usually refers to diabetes in a pregnant woman who did not have diabetes before becoming pregnant.<sup>1</sup>

GDM is an important public health problem in India from two perspectives – as a factor influencing safe motherhood and as a precursor of Type 2 DM. It is an important and often inadequately recognized contributor to maternal and fetal mortality and morbidity. Since all women are not screened for GDM during pregnancy and a woman's blood

sugars may normalize after delivery, it is often hard to confirm if GDM has contributed to morbidity and mortality.<sup>2</sup> But it is quite likely that a sizeable number of ‘unexplained’ or ‘sudden’ fetal losses could be attributed to GDM. With adequate screening and clinical management, this complication and many others could be avoided, for both mother and child.

The prevalence of GDM as reported from various places in India varies widely, ranging from 3.8% in Kashmiri women to 6.2% in Mysore to 17.9% in Tamil Nadu.<sup>3,4,5</sup> From the perspective of chronic, non-communicable diseases, many women who

have GDM and their offspring are at a higher risk of developing type-2 DM in later life. Thus, appropriate management of GDM will go a long way in reducing the number of people that could be affected by Type 2 diabetes in future years. GDM occurs when a woman's pancreatic function is not sufficient to overcome the diabetogenic environment of pregnancy and causes high blood glucose levels due to the body's extra demand for insulin.<sup>1</sup> A variety of factors like age, diet, obesity, ethnicity, family history, history of GDM in previous pregnancy, macrosomia, essential hypertension or pregnancy-related hypertension, history of spontaneous abortions, and unexplained stillbirths cause an increased risk of glucose intolerance in pregnant women. The "Women in India with Gestational Diabetes Mellitus Strategy (WINGS)" program, jointly conducted by the International Diabetes Federation (IDF), the Madras Diabetes Research Foundation and the Abbott Fund, highlighted that pre-diabetes and diabetes affect approximately six million births in India alone, of which 90% are due to GDM.<sup>6</sup>

Addressing Gestational Diabetes Mellitus involves multiple stakeholders. Since field based health workers are the first point of contact for many pregnant women, they are positioned appropriately to provide awareness education, counselling, referral and follow up services.<sup>2</sup>

The essential components of GDM management include: primary prevention, screening for early diagnosis and good clinical management to prevent and/or delay the onset of complications. Timely diagnosis of GDM will allow initiation of appropriate treatment to prevent & minimize the ill effects of uncontrolled GDM on the mother and child.

In view of all the above mentioned facts, the present study was carried out to know profile of Health care providers in the Ahmedabad Municipal Corporation, their knowledge about GDM and its management. The reassessment of their knowledge was also carried out after training program and based on that effectiveness of training program was evaluated.

## METHODS

A cross sectional study was carried out amongst 400 health care providers of Ahmedabad Municipal Corporation who attended the GDM Training session. One day training program was conducted for GDM for six batches (60-70 participants / batch) of health care providers. Health care providers included urban ASHA, ANM, Lab Technician (LT), General Nursing Midwifery (GNM), Pharmacist, Multipurpose Health Worker

(MPHW). Participants were included from Ahmedabad Municipal Corporation's (AMC's) 15 Urban Health Centers. All health care providers who participated in training were included. The study was carried out from July 2016 to December 2016. A pre-designed and pre-tested questionnaire in which few questions were open ended and few were close ended was used for pre and post training assessment of the knowledge of the participants. Questionnaire included Knowledge about definition, its ill effects on mother and baby, details of diagnostic test, treatment and management, post delivery period at which women to be re-tested and prevention of GDM. Questionnaire was translated in Gujarati language and explained to the respondents. Formats were given to the respondents and they were given 15 minutes time to fill. Pilot testing was done amongst 10 people before using it to collect data. The training program comprised of two interactive lectures of 45 minutes each using power point presentations. First lecture was taken regarding DM and GDM followed by second lecture on diagnosis, and management of GDM. The faculties of community medicine having qualification MD in PSM had taken sessions during the training program. All participants were also shown a 15 minutes video (which was prepared locally) regarding method of testing blood sugar with use of glucometer and performing OGTT. The guidelines of WHO and MOHFW regarding GDM were used for preparation of the training materials to ensure the quality. Data were analyzed using Microsoft excel 2007 and spss version 17. Calculation of frequencies, percentages, proportions, mean, standard deviation and correlation coefficient were carried out. Chi-square and unpaired t-test were carried out for comparison of pre test and post test knowledge of the respondents.

## RESULTS

A total of 400 health care providers were included out of that 392 (98%) were females and 8(2%) were males. The Mean age of participants was  $33 \pm 8$  years. 295 (74%) participants belonged to ASHA cadre, 62 (15.5%) participants belonged to ANM, 16 (4%) participants were LT Cadre, 10 (2.5%) participants belonged to GNM cadre, 9 (2.2%) participants belonged to MPHW Cadre and 8 (2%) belonged to Pharmacist cadre. (Table 1)

Regarding the knowledge of definition of GDM, in Pre-test (i.e. before training) 162(40.5%) participants could correctly answer and in post-test (i.e. post training) 200 (50%) participants could correctly answer. Comparison of pre and post-test result was statistically significant ( $p=0.014$ ). This suggests that significantly more participants could define GDM after training.

**Table 1: Profile of health care workers**

Variable	Number (n=400) (%)
<b>Age (Years)</b>	
20-24	55 (14)
25-29	88 (22)
30-34	60 (15)
35-39	66 (17)
40-44	59 (14.75)
45-49	40 (10)
50-54	32 (8)
<b>Gender</b>	()
Female	392 (98)
Male	8 (2)
<b>Category of health care worker</b>	()
ASHA	295 (73.8)
ANM	62 (15.5)
MPHW	9 (2.2)
GNM	10 (2.5)
LT	16 (4)
Pharmacist	8 (2)
<b>Ward of AMC</b>	()
Amraiwadi	27 (6.75)
Behrampur	22 (6)
bhaipura	42 (11)
Bodakdev	18 (5)
Kakaria	24 (6)
Khadiya	19 (4.75)
Khokhara	25 (6)
Lambha	41 (10.25)
Maninagar	26 (7.5)
Raikhad	18 (5)
Ramol	32 (8)
Sankalitnagar	26 (4)
Thaltej	13 (3)
Vejalpur	19 (4.75)
Vatva	21 (5)
Vastral	27 (7)

Maternal risk of GDM include preeclampsia, need for caesarean section, prolonged labour, postpartum haemorrhage and perineal tear. She might have a large baby resulting in a complicated delivery (like shoulder dystocia) and higher probability

of needing a caesarean section. In the present study, participants were asked the question regarding the effect of GDM on mother. Regarding knowledge of risk of preeclampsia in GDM women 202(50.5%) participants could correctly answer in pre-test, while in post-test 220(55%) participants could correctly answer. Result was statistically significant (p=0.04).

Regarding knowledge of risk of need for caesarean section 125 (31.25%)participants could correctly answer in pre-test, while in post-test 253(63%) participants could correctly answer.(p<0.0001)

Regarding knowledge of risk of prolong labour 110 (25%) participants could correctly answer in pre-test, while in post-test 259(64.75%) participants could correctly answer.(p<0.0001)

Regarding knowledge of risk of post-partum haemorrhage, 119(29.7%) could correctly answer in pre-test while in post-test 237 (60%) participants could correctly answer. Knowledge gain as assessed by post-test was statistically significant (p<0.0001).

Regarding knowledge of risk of perineal tear, 121(30.2%) participants could correctly answer in pre-test while in post-test 243 (60.7%) could correctly answer.(p<0.0001)

Regarding knowledge of all maternal risks of GDM, 85(21.25%) could correctly answer in pre-test while in post-test 220(55%) participants could correctly answer. (p<0.0001)

Effects of GDM on new born are large baby (macrosomia), hypoglycaemia, higher risk for breathing problems, hypothermia, tremors and even seizures. Other morbidities that potentially occurs more frequently in infants of women with GDM include hypoglycemia, hyperbilirubinemia, hypocalcemia, erythremia, and poor feeding.

**Table2: Awareness about effects of GDM on mother and foetus**

Knowledge about	Pre-test freq (%)	C.I. of %	Post-test freq (%)	C.I. of %	P value
Correctly define gestational diabetes	162 (40.5)	34.17- 45.83	200 (50)	45.09 - 54.91	0.014
<b>Effect of GDM on Mother</b>					
Preeclampsia	202 (50.5)	45.64 - 55.36	220 (55)	50.58 - 59.42	0.004
Caesarean section	125 (31.25)	24.50 - 38.00	253 (63.25)	59.64 - 66.86	<0.0001
Prolonged labour	100 (25)	17.64 - 32.36	259 (64.75)	61.29 - 68.21	<0.0001
Post- partum haemorrhage	119 (29.7)	17.64 - 32.36	237 (60)	56.01 - 63.99	<0.0001
Perineal tear	121 (30.25)	24.34 - 38.16.	243 (60.7)	56.85 - 64.55	<0.0001
All of the above	85 (21.25)	13.52 - 28.98	220 (55)	50.58 - 59.42.	<0.0001
<b>Effect of GDM on Newborn</b>					
Macrosomia	107 (26.75)	19.56 - 33.94	270 (67.5)	64.31 - 70.69.	<0.0001
still birth	78 (19.5)	11.60 - 27.40	221 (55.25)	50.86 - 59.64.	<0.0001
Hypoglycemia	64 (16)	7.76 - 24.24	211 (52.7)	48.06 - 57.34	<0.0001
congenital Malformation	137 (34.25)	27.80 - 40.70	222 (55.5)	51.13 - 59.87.	0.009
All of the above	56 (14)	5.56 - 22.44	210 (52.5)	47.84 - 57.16.	<0.0001

**Table3: Awareness about guidelines for screening and management of GDM**

Knowledge about	Pre-test freq(%)	C.I. of %	Post-test (%)	C.I. of %	P value
<b>Test for Diagnosis</b>	137 (34.2)	27.75 - 40.65.	207 (51.7)	46.97 - 56.43	<0.0001
<b>Gestational age woman should be tested</b>	43 (10.7)	1.96 - 19.44	283 (70.7)	67.83 - 73.57.	0.0017
<b>Amount of glucose given in OGTT test</b>	11 (2.7)	0.26 - 5.14.	279 (70)	67.04 - 72.96	<0.0001
<b>Blood Sugar level in OGTT diagnosis of GDM</b>	109 (27.2)	20.07 - 34.33	250 (62.5)	58.82 - 66.18.	<0.0001
<b>Treatment of GDM</b>					
Medical nutritional therapy	124 (31)	24.23 - 37.77	217 (54.2)	49.71 - 58.69.	<0.0001
Oral medication	199 (49.7)	44.77 - 54.63	274 (68.5)	65.41 - 71.59.	<0.0001
Insulin	118 (29.5)	22.58 - 36.42.	223 (55.7)	51.36 - 60.04	<0.0001
Change in lifestyle	109 (27.25)	20.11 - 34.39	244 (61)	57.17 - 64.83.	<0.0001
All of the above	67 (16.7)	8.54 - 24.86	209 (52.2)	47.51 - 56.89	<0.0001

Additionally, if a woman is diabetic before becoming pregnant (called pre-GDM) and her sugars are not well controlled during the first trimester, when the baby's organs are forming the risk of congenital malformation and/or miscarriage is increased.

Participants were asked the question regarding the effect of GDM on Newborn.

Regarding Knowledge of effect of GDM on newborn i.e. Macrosomia, 107(26%), participants could correctly answer before training (i.e. pre-test) while post training(i.e. post-test)270(67.5%) participants could correctly answer. Knowledge gain post training was statistically significant ( $p<0.0001$ ). Regarding knowledge of risk of still birth in newborn, 78(19.50%) participants could correctly answer before training (i.e pre-test) while post-training 225(55.25%) participants could correctly answer. Knowledge gain as assessed by post- test was statistically significant ( $p<0.0001$ ). Regarding knowledge of risk of Hypoglycaemia in new born, 64(16%) participants could correctly answer before training while 211(52%) participants could correctly answer post training. Result shows adequate gain in knowledge post training ( $p<0.0001$ ). Regarding knowledge of risk of congenital malformation in new born, 137(34.25%) participants could correctly answer before training while 222(55.5%) participants could correctly answer after training. Result in knowledge gain was statistically significant( $p=0.009$ ).Regarding knowledge of all the risk factors, 56(14%) participants could correctly answer before training while 210(52.50%)participants could correctly answer post training. Knowledge gain post training was statistically significant ( $p<0.0001$ ). (Table2)

OGTT is recommended by WHO for diagnosis of GDM and should be done during 24-28 weeks of pregnancy.

Regarding knowledge of test for diagnosis of GDM before training i.e pretest 137(34%) could correctly answer while 207(51.2%) participants could correctly answer post training.( $p<0.0001$ )Regarding knowledge of gestational age at which women should be tested for GDM 43(10.7%) participants

could correctly answer before training while 283(70%)participants could correctly answer after training . ( $P<0.0001$ )

Knowledge about diagnostic level of blood sugar to confirm GDM in OGTT test was as follows, in pretest before training 109(27%) participants could correctly answer while 250(62.5) participants could correctly answer post training. ( $P<0.0001$ ) Knowledge regarding treatment of GDM i.e Medical nutritional therapy, 124(31%) participants could correctly answer before training while 217(54.2%) could correctly answer post training. ( $<0.0001$ ) Knowledge regarding treatment with oral medication 199(49%) participants could correctly answer before training while 274 (68.5%) participants could correctly answer post training. Result in knowledge gain was statistically significant ( $P<0.0001$ ).Knowledge regarding treatment of GDM with insulin 118 (29.5%) could correctly answer before training while 223(55%) participants could correctly answer post training. Result in knowledge gain post training was statistically significant ( $p<0.0001$ ). Knowledge regarding treatment of GDM i.e change in lifestyle 109 (27.25%) participants could correctly answer before training while 244(61%) participants could correctly answer post training. Knowledge gain post training was statistically significant ( $p<0.0001$ ). Knowledge regarding about all of the treatment modalities in GDM 67 (16%) participants could correctly answer before training while 209(52%) could correctly answer post training. Result in knowledge gain post training was statistically significant ( $p<0.0001$ ). Regarding knowledge of retest of GDM post-delivery 105(26.2%) could correctly answer before training while 218(54.5%) could correctly answer post training. Knowledge gain post training was statistically significant ( $P<0.0001$ )

## DISCUSSION

In the present study majority of the health care workers were in the age group 25-29 years with mean age of 33+8years. In a study by Bhavadharini et al which was carried out amongst pregnant



women the mean age of the women was  $25 \pm 4$  years.<sup>7</sup> In another study which was also amongst the pregnant women mean age of respondents was  $23.8 \pm 2.94$  years.<sup>8</sup>

In the present study all cadres of Primary Health Care providers in the urban areas except medical officers were involved. In another study the target population was doctors, midwives and nurses.<sup>9</sup> In many similar studies the target population was pregnant women.<sup>7,8</sup> The present study was conducted amongst primary health workers as they are the first point of contact between community and health care system.

The increasing prevalence of GDM shows the necessity to train health care workers by imparting knowledge and developing skills to deliver high quality care that meets the needs of patients. In the present study 40.50% workers could correctly define GDM before training which increased to 50% post-training. Fifty eight per cent of patients were aware about occurrence of GDM in a study by Lucy et al.<sup>10</sup> Another study noted awareness level of 85% about GDM.<sup>8</sup> In a study among pregnant women 88.7% and 51.2% women from urban and rural areas believed that the screening for GDM has to be done.<sup>7</sup>

In a similar study 89% of the family physicians and 50% of obstetricians knew about definition of GDM.<sup>11</sup> In the present study 21.25% and 55% health workers could tell about maternal complications of GDM pre and post training respectively. Regarding fetal complications 14% and 52.5% could mention all the complications pre and post training respectively. Maternal and foetal complications of GDM were recognized by 83% and 89% of FPs respectively and all the obstetricians recognized the maternal and foetal complications of GDM in another study.<sup>11</sup> In a study by Gastrich MD et al risk for foetus was mentioned by 9.4% and risk to mother was mentioned by 8.2% respondents.<sup>12</sup> Eighty percent stated that GDM was associated with a higher risk for the development for hypertension and 96% with type 2 diabetes in the mother in one study.<sup>13</sup>

In a study 8.3% respondents could tell about correct time of testing a pregnant women for GDM.<sup>8</sup> In the present study 10.7% could tell that pregnant women should be tested for GDM at 24-28 weeks before training which increased to 70.7% after training.

In the present study 16.7% health workers could tell about all aspects of management of GDM before training which increased to 52.2% after training. In another study 64% respondent mentioned about life style modification and 17.5% mentioned about insulin injection as management for GDM.<sup>8</sup>

In a study by Tingting et al it was concluded that the main first-line treatment strategy to control glucose levels was a combination of dietary and exercise and whenever first-line interventions were not effective, medication was recommended.<sup>14</sup>

Women who suffer from GDM are at increased risk of Type 2 Diabetes Mellitus in their later life hence they should be tested for their blood sugar post-delivery. This was known to 26.2% respondents before training and 54.4% after training in the present study. In another study results showed that almost 30% of the obstetric population in Riyadh suffers from the adverse effects of either pre-GDM or GDM and that nearly 50% of pregnant women with T2DM were unaware of their condition.<sup>15</sup> The present study reported increase in knowledge of the respondents in all aspects related to screening and management of GDM and has identified the need for training. It was reported in another study that although 56.8% of the doctors had some pre-service training on gestational diabetes, most nurses and midwives lacked such training.<sup>9</sup>

## CONCLUSIONS

Knowledge about GDM is poor amongst health care providers and training program could significantly improve their knowledge. This highlights the need for training for all aspects of GDM. Increased education about GDM is necessary for its proper screening and management as per the guidelines. All this will improve care of women with GDM-affected pregnancies.

## REFERENCES

1. National guidelines for diagnosis and management of gestational diabetes mellitus available at [http://nhm.gov.in/images/pdf/programmes/maternal-health/guidelines/National\\_Guidelines\\_for\\_Diagnosis\\_&\\_Management\\_of\\_Gestational\\_Diabetes\\_Mellitus.pdf](http://nhm.gov.in/images/pdf/programmes/maternal-health/guidelines/National_Guidelines_for_Diagnosis_&_Management_of_Gestational_Diabetes_Mellitus.pdf) accessed 21/11/17
2. Addressing Gestational Diabetes Mellitus - A reference manual available at [https://www.worlddiabetesfoundation.org/sites/default/files/GDM%20Reference%20Manual\\_WDF08-381.pdf](https://www.worlddiabetesfoundation.org/sites/default/files/GDM%20Reference%20Manual_WDF08-381.pdf) accessed 21/11/2017
3. Abdul Hamid Zargar, Mohammad Iqbal Sheikh, Mir Iftikar Bashir, Shariq Rashid Masoodi, Bashir Ahmad Laway, Arshad Iqbal Wani, Mohammad Hayat Bhat, Farooq Ahmad Dar. Prevalence of gestational diabetes mellitus in Kashmiri women from the Indian subcontinent. *Diabetes Research and Clinical Practice*. 2004; Vol.66(2),139-45.
4. C Hill, GV Krishnaveni, I Annamma. Glucose tolerance in pregnancy in South India: relationships to neonatal anthropometry. *Acta Obstetrica et Gynecologica Scandinavica*. 2005; 84(2): 159-65
5. Mohan V, Deepa M, Deepa R, Shanthirani CS, Farooq S, Ganesan A, Datta M. Secular trends in the prevalence of diabetes and impaired glucose tolerance in urban South India - the Chennai Urban Rural Epidemiology Study (CURES-17). *Diabetologia*. 2006;49(6):1175-8.

6. Manni Mohanraj Mahalakshmi, Balaji Bhavadharini, Kumar Maheswari, Ranjit Mohan Anjana, SaravananJebarani, LyudmilNinov, ArivudainambKayal, BelmaMalanda, Anne Belton, Ram Uma, Viswanathan Mohan, Ranjit Unnikrishnan. Current practices in the diagnosis and management of gestational diabetes mellitus in India (WINGS-5). *Indian J Endocrinol Metab* 2016; 20(3):364-8.
7. BalajiBhavadarini, Mohan Deepa, Sivagnanam Nallape-rumal1, Ranjit Mohan Anjana, Viswanathan Mohan. Knowledge about Gestational Diabetes Mellitus amongst Pregnant Women in South Tamil Nadu. *J Diabetol* 2017;8:22-6.
8. Shriram V, Rani SM, Sathiyasekaran B, Mahadevan S. Awareness of gestational diabetes mellitus among antenatal women in a primary health center in South India. *Indian J EndocrMetab* 2013;17:146-8.
9. Utz B, Assaraq B, Essolbi A, Barkat A, Delamou A, De Brouwere V. Knowledge and practice related to gestational diabetes among primary health care providers in Morocco: Potential for a defragmentation of care? *Prim Care Diabetes* 2017;11(4):389-96.
10. Lucy Anne Price, Lauren Jade Lock, Lucy Elizabeth Archer and Zubair Ahmed. Awareness of Gestational Diabetes and its Risk Factors among Pregnant Women in Samoa. *Hawaii J Med Public Health* 2017; 76(2):48-54.
11. Appajigol JS, Bellary S. Knowledge and practices of rural family physicians and obstetricians towards gestational diabetes mellitus. *Int J Community Med Public Health* 2015;2:153-5.
12. Gastrich MD et al. Gestational diabetes mellitus: An educational opportunity. *Journal of Diabetes Nursing*. 2013;17: 220-4
13. Schmitz S, Groten T, Schleussner E, Battefeld W, Hillemanns P, Schippert C, von Versen-Hoyneck F. Gestational diabetes mellitus: an evaluation of gynecologists' knowledge of guidelines and counseling behavior. *Arch GynecolObstet* 2016;294(6):1209-17.
14. TingtingXu, Yasheng He, LiviaDainelli, Kia Yu, Patrick Detzel, Irma Silva-Zollezi, Sheri Volger, Hai Fang. Healthcare interventions for the prevention and control of gestational diabetes mellitus in China: a scoping review. *BMC Pregnancy Childbirth* 2017;17:171.
15. Prevalence and Complications of Pregestational and Gestational Diabetes in Saudi Women: Analysis from Riyadh Mother and Baby Cohort Study (RAHMA). HayfaaWahabi, Amel Fayed, SamiaEsmail, HebaMamdouh, RehamKotb *Biomed Res Int*. 2017; 2017: 6878263. Published online 2017 Mar 12. doi: 10.1155/2017/6878263 PMID: PMC5366208