An Application of Nano Topology in Attribute Reduction in Medical Diagnosis for Gestational Diabetes

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Abstract : *The aim of this study are to examine the role of potential risk factors for Gestational Diabetes, and to investigate whether any single or accumulated risk factor(s) could be used to predict the disease using the concept of nano topology.*

Keywords: *Application of nano topology, Attribute reduction in complete information system, Gestational diabetes, Medical Diagnosis.*

1. Introduction

Gestational Diabetes is diabetes diagnosed for the first time during pregnancy (gestation). Like other types of diabetes, gestational diabetes affects how our cells use sugar (glucose). It causes high blood sugar that can affect the pregnancy and the baby's health. When we eat, our pancreas releases insulin, a hormone that helps move a sugar called glucose from our blood to our cells, which use it for energy. During pregnancy, our placenta makes hormones that cause glucose to build up in our blood. Usually, our pancreas can send out enough insulin to handle it. But if our body can't make enough insulin or stops using insulin like it should, our blood sugar levels rise, and we get gestational diabetes. It can happen at any stage of pregnancy, but is more common in the second or third trimester.

Gestational diabetes can cause problems for the mother and her baby during pregnancy and after birth. But the risks can be reduced if the condition is detected early and well managed. It does not usually cause any symptoms. Most cases are only discovered when the blood sugar levels are tested during screening for gestational diabetes. Some women may develop symptoms if their blood sugar levels gets too high (hyperglycemia), such as:

- increased thirst
- needing to pee more often than usual
- a dry mouth
- tiredness

Any woman can develop gestational diabetes during pregnancy, but they are at an increased risk if they

- are overweight
- are over age 28
- had gestational diabetes during a past pregnancy
- have given birth to a baby weighing more than 4kg.

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- have a family history of type 2 diabetes
- have Polycystic Ovary Syndrome (PCOS)

Most women with gestational diabetes have otherwise normal pregnancies with healthy babies.

However, gestational diabetes can cause problems such as:

- the baby growing larger than usual – this may lead to difficulties during the delivery and increases the likelihood of needing induced labor or a caesarean section
- polyhydramnios – too much amniotic fluid (the fluid that surrounds the baby) in the womb, which can cause premature labor or problems at delivery
- premature birth – giving birth before the 37th week of pregnancy
- pre-eclampsia – a condition that causes high blood pressure during pregnancy and can lead to pregnancy complications if not treated
- your baby developing low blood sugar or yellowing of the skin and eyes (jaundice) after he or she is born, which may require treatment in hospital
- the loss of your baby (stillbirth) – though this is rare

Having gestational diabetes also means the mother is at an increased risk of developing type 2 diabetes in the future. Here we apply the basis of nano topology to find the key factors of a common disease, 'Gestational Diabetes' among women using topological reduction of attributes in complete information system.

The concept of Nano topology was first introduced by M. Lellis Thivagar [6] and is defined as follows: Let U be a non-empty finite set of objects called the universe and R be an equivalence relation of U named as the indiscernibility relation. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair *(U, R)* is said to be the approximation space. Let $X \subseteq U$.

(i) The lower approximation of X with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is, $L_R(X) = \bigcup \{R(x) : R(x) \subseteq X\}$ where R(x) denotes the equivalence class determined by X.

(ii) The upper approximation of X with respect to R is the set of all objects which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$. That is, $U_R(X) = \bigcup \{R(x) : R(x) \cap X \neq \phi\}$.

(iii) The boundary region of X with respect to R is the set of all objects, which can be classified neither X nor as not X with respect to R and it is denoted by $B_R(X)$. That is $B_R(X) = U_R(X) - L_R(X)$.

Information is one of the key factors in developing knowledge. The reduction of information system is an important mathematical treatment, which have a prime role in the process of knowledge discovery. In the analysis of data presented in terms of complete information and decision system, the rough set model which is developed by Pawlak [11] is very useful. J.W.Gryzymala-Busse [1] and M.Kryszkiewicz [8] have obtained some important results for incomplete information systems with missing attribute values. Using dominance relations in set- valued ordered information systems, the problems of criteria reductions were investigated and decision rules were extracted by Yuhua Qian [12] . Molodstov [9] initiated the soft set theory, that has a rich potential for applications in several directions, few of which had been shown by him in his pioneer work. This paper deals with the application of nano topological structure that makes the way for knowledge reduction in real life situations.

2. Methodology

The data used for this study was collected directly from a reputed maternity hospital in Coimbatore, a district of Tamil Nadu and most common 10 cases were taken for the problem. The following are the needed definition and algorithm to find the solution of the problem.

Let U and A be two non-empty finite sets, where U is the universe and A, the set of attributes. With every attribute α in A, we associate a set V_α of its values. An information system may possess more than one reduct. However, in real life situations, we are interested in a particular reduct, such as the minimal reduct or any reduct containing the key attributes. Such an attribute set is called the core, which is introduced in terms of base as follows.

Definition : Let (U,A) be an information system, where A is divided into a set C_1 of condition attributes and a set C_2 of decision attribute. A subset R of C_1 is said to be a core, if $\beta_R = \beta_{C_1}$ and $\beta_R \neq \beta_{R-\{r\}}$, for all r ∈ R, where β_R is the basis of nano topology corresponding to R ⊆ C_1. That is, a core is a minimal subset of attributes which is such that none of its elements can be removed without affecting the classification power of attributes.

Algorithm :

Step 1: Let U be a finite universe and A be a finite set of attributes that is divided into two classes, C_1 of condition attributes and C_2 of decision attribute. Let R be an equivalence relation on U corresponding to C_1 and a subset X of U, represent the data as an information table, columns of which are labeled by attributes and rows by objects. The entries of the table are the attribute values.

Step 2: Find the lower and the upper approximations and the boundary region of X with respect to R.

Step 3: Generate the nano topology $\tau_{C_1}(X)$ on U and its basis $\beta_{C_1}(X)$ corresponding to the conditional attribute set C_1.

Step 4: Remove an attribute x from C_1 and find the lower and upper approximations and the boundary region of X with respect to the equivalence relation on C_1 - $\{x\}$.

Step 5: Generate the nano topology $\tau_{C_1-\{x\}}(X)$ on U and its basis $\beta_{C_1-x}(X)$.

Step 6: Repeat steps 3 and 4 for all attributes in C_1.

Step 7: Those attributes in C for which $\beta_{C_1-\{x\}}(X) \neq \beta_{C_1}(X)$ form the core.

Now, we consider the following problem.

3. Problem :

Risk factors are conditions or habits that make a person more likely to develop a disease. Here we apply the nano topology to find the key factors of “Gestational Diabetes” using topological reduction of attributes in complete information system. The following table shows the information about patients who are overweight, are over age 28, had gestational diabetes during a past pregnancy, have given birth to a baby weighing more than 4kg., have a family history of type 2 diabetes and have Polycystic Ovary Syndrome (PCOS). The problem is to find the key factor to have gestational diabetes during pregnancy period.

Table 1 : Table of Attribute Values of Gestational Diabetes

Patients	Over weight	Over age 28	Had gestational diabetes during a past pregnancy	Have given birth to a baby weighing more than 4kg	Have a family history of type 2 diabetes	Have Polycystic Ovary Syndrome (PCOS)	Result
P_1	√	√	√	×	×	×	Yes
P_2	×	√	√	√	×	×	Yes
P_3	×	√	√	×	√	×	No
P_4	√	×	×	×	×	√	Yes
P_5	√	√	×	×	×	√	No
P_6	×	√	√	×	√	×	Yes
P_7	×	√	√	×	×	√	Yes
P_8	√	√	×	×	√	×	No
P_9	√	√	×	×	√	×	Yes
P_{10}	√	√	√	√	×	×	Yes

The columns of the table represent the risk factors for Gestational Diabetes and the rows represent the patients. The entries in the table are the attribute values. The given information system is complete and is given by $(U, A)$where $U = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}\}$and A= { over weight (OW), over age 28 (OA), had gestational diabetes during a past pregnancy (PP), have given birth to a baby weighing more than 4kg. (BW), have a family history of type 2 diabetes (FH), have Polycystic Ovary Syndrome (PCOS), gestational diabetes } which is divided into a set C_1 of condition attributes given by C_1 = { OW,OA, PP, BW, FH, PCOS} and a set C_2 = { gestational diabetes } of decision attribute. The maximal tolerance classes corresponding to all the condition attributes are given by $\{P_1\}$, $\{P_2\}$, $\{P_3,P_6\}$, $\{P_4\}$, $\{P_5\}$, $\{P_7\}$, $\{P_8,P_9\}$ and $\{P_{10}\}$ and hence $U/R(C_1) = \{\{P_1\}, \{P_2\}, \{P_3, P_6\}, \{P_4\}, \{P_5\}, \{P_7\}, \{P_8, P_9\}, \{P_{10}\}\}$.

Case I: (Patients diagnosed with Gestational Diabetes)

Let $X = \{P_1, P_2, P_4, P_6, P_7, P_9, P_{10}\}$, the set of patients with gestational diabetes. Then the corresponding lower, upper approximations and the boundary region of X are given by $L_{C_1}(X) = \{P_1, P_2, P_4, P_7, P_{10}\}$, $U_{C_1}(X) = \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}$ and

$B_{C_1}(X) = \{P_3, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1}(X) = \{\phi, U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1}(X) = \{U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$.

When the attribute "overweight" is removed from C_1, the family of tolerance classes, the approximations, and the boundary region of X corresponding to $C_1-\{OW\}$ are, $L_{C_1-\{OW\}}(X) = \{P_1, P_2, P_4, P_7, P_{10}\}$, $U_{C_1-\{OW\}}(X) = \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}$ and $B_{C_1-\{OW\}}(X) = \{P_3, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{ow\}}(X) = \{\phi, U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1-\{ow\}}(X) = \{U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_3, P_6, P_8, P_9\}\} = \beta_{C_1}(X)$.

When the attribute "over age 28" is removed from C_1, $U/R(C_1 - \{OA\}) = \{\{P_1\}, \{P_2\}, \{P_3, P_6\}, \{P_4, P_5\}, \{P_7\}, \{P_8, P_9\}, \{P_{10}\}\}$. $L_{C_1-\{OA\}}(X) = \{P_1, P_2, P_7, P_{10}\}$, $U_{C_1-\{OA\}}(X) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}\}$ and $B_{C_1-\{OA\}}(X) = \{P_3, P_4, P_5, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{oA\}}(X) = \{\phi, U, \{P_1, P_2, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_4, P_5, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1-\{oA\}}(X) = \{U, \{P_1, P_2, P_7, P_{10}\}, \{P_3, P_4, P_5, P_6, P_8, P_9\}\} \neq \beta_{C_1}(X)$.

When the attribute "had gestational diabetes during a past pregnancy" is removed from C_1, $U/R(C_1 - \{PP\}) = \{\{P_1\}, \{P_2\}, \{P_3, P_6\}, \{P_4\}, \{P_5\}, \{P_7\}, \{P_8, P_9\}, \{P_{10}\}\}$. $L_{C_1-\{PP\}}(X) = \{P_1, P_2, P_4, P_7, P_{10}\}$, $U_{C_1-\{PP\}}(X) = \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}$ and $B_{C_1-\{PP\}}(X) = \{P_3, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{PP\}}(X) = \{\phi, U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1-\{PP\}}(X) = \{U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_3, P_6, P_8, P_9\}\} = \beta_{C_1}(X)$.

When the attribute "have given birth to a baby weighing more than 4 kg." is removed from C_1, $U/R(C_1 - \{BW\}) = \{\{P_1, P_{10}\}, \{P_2\}, \{P_3, P_6\}, \{P_4\}, \{P_5\}, \{P_7\}, \{P_8, P_9\}\}$. $L_{C_1-\{BW\}}(X) = \{P_1, P_2, P_4, P_7, P_{10}\}$, $U_{C_1-\{BW\}}(X) = \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}$ and $B_{C_1-\{BW\}}(X) = \{P_3, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{Bw\}}(X) = \{\phi, U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1-\{Bw\}}(X) = \{U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_3, P_6, P_8, P_9\}\} = \beta_{C_1}(X)$.

When the attribute "have a family history of type 2 diabetes" is removed from C_1, $U/R(C_1 - \{FH\}) = \{\{P_1\}, \{P_2\}, \{P_3, P_6\}, \{P_4\}, \{P_5\}, \{P_7\}, \{P_8, P_9\}, \{P_{10}\}\}$. $L_{C_1-\{FH\}}(X) = \{P_1, P_2, P_4, P_7, P_{10}\}$, $U_{C_1-\{FH\}}(X) = \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}$ and $B_{C_1-\{FH\}}(X) = \{P_3, P_6, P_8, P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{FH\}}(X) = \{\phi, U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_1, P_2, P_3, P_4, P_6, P_7, P_8, P_9, P_{10}\}, \{P_3, P_6, P_8, P_9\}\}$ and the basis is $\beta_{C_1-\{FH\}}(X) = \{U, \{P_1, P_2, P_4, P_7, P_{10}\}, \{P_3, P_6, P_8, P_9\}\} = \beta_C(X)$.

When the attribute "have polycystic ovary syndrome" is removed from C_1, $U/R(C_1 - \{PCOS\}) = \{\{P_1\}, \{P_2\}, \{P_3, P_6\}, \{P_4\}, \{P_5\}, \{P_7\}, \{P_8, P_9\}, \{P_{10}\}\}$.

$L_{C_1-\{PCOS\}}(X)=\{P_1,P_2,P_4,P_7,P_{10}\}$, $U_{C_1-\{PCOS\}}(X)=\{P_1,P_2,P_3,P_4,P_6,P_7,P_8,P_9,P_{10}\}$ and $B_{C_1-\{PCOS\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{PCOS\}}(X)=\{\phi,U,\{P_1,P_2,P_4,P_7,P_{10}\},\{P_1,P_2,P_3,P_4,P_6,P_7,P_8,P_9,P_{10}\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{PCOS\}}(X)=\{U,\{P_1,P_2,P_4,P_7,P_{10}\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

Since $\beta_{C_1-\{ow\}}(X)=\beta_{C_1}(X)$, $\beta_{C_1-\{PP\}}(X)=\beta_{C_1}(X)$, $\beta_{C_1-\{Bw\}}(X)=\beta_{C_1}(X)$, $\beta_{C_1-\{FH\}}(X)=\beta_{C_1}(X)$ and $\beta_{C_1-\{PCOS\}}(X)=\beta_{C_1}(X)$, the condition attributes OW, PP, BW, FH and PCOS are the reducts from C_1, Therefore, CORE = {OA}, which is minimal .

Case : II (Patients diagnosed without Gestational Diabetes)

Let $X=\{P_3,P_5,P_8\}$, the set of patients diagnosed without gestational diabetes. Then the corresponding lower, upper approximations and the boundary region of X are given by $L_{C_1}(X)=\{P_5\}$, $U_{C_1}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the nano topology is $\tau_{C_1}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the corresponding basis is $\beta_{C_1}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}$.

When the attribute "overweight" is removed from C_1, $U/R(C_1-\{OW\})=\{\{P_1\},\{P_2,P_{10}\},\{P_3,P_6\},\{P_4\},\{P_5\},\{P_7\},\{P_8,P_9\}\}$. $L_{C_1-\{OW\}}(X)=\{P_5\}$, $U_{C_1-\{OW\}}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{OW\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{ow\}}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{ow\}}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

When the attribute "over age 28" is removed from C_1, $U/R(C_1-\{OA\})=\{\{P_1\},\{P_2\},\{P_3,P_6\},\{P_4,P_5\},\{P_7\},\{P_8,P_9\},\{P_{10}\}\}$. $L_{C_1-\{OA\}}(X)=\phi$, $U_{C_1-\{OA\}}(X)=\{P_3,P_4,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{OA\}}(X)=\{P_3,P_4,P_5,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{oA\}}(X)=\{\phi,U,\{P_3,P_4,P_5,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{oA\}}(X)=\{U,\{P_3,P_4,P_5,P_6,P_8,P_9\}\}\neq\beta_{C_1}(X)$.

When the attribute "had gestational diabetes during a past pregnancy" is removed from C_1, $U/R(C_1-\{PP\})=\{\{P_1\},\{P_2\},\{P_3,P_6\},\{P_4\},\{P_5\},\{P_7\},\{P_8,P_9\},\{P_{10}\}\}$. $L_{C_1-\{PP\}}(X)=\{P_5\}$, $U_{C_1-\{PP\}}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{PP\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{PP\}}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{PP\}}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

When the attribute "have given birth to a baby weighing more than 4 kg." is removed from C_1, $U/R(C_1-\{BW\})=\{\{P_1,P_{10}\},\{P_2\},\{P_3,P_6\},\{P_4\},\{P_5\},\{P_7\},\{P_8,P_9\}\}$. $L_{C_1-\{BW\}}(X)=\{P_5\}$, $U_{C_1-\{BW\}}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{BW\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{Bw\}}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{Bw\}}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

When the attribute "have a family history of type 2 diabetes" is removed from C_1, $U/R(C_1-\{FH\})=\{\{P_1\},\{P_2\},\{P_3,P_6\},\{P_4\},\{P_5\},\{P_7\},\{P_8,P_9\},\{P_{10}\}\}$. $L_{C_1-\{FH\}}(X)=\{P_5\}$, $U_{C_1-\{FH\}}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{FH\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{FH\}}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{FH\}}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

When the attribute "have polycystic ovary syndrome" is removed from C_1, $U/R(C_1-\{PCOS\})=\{\{P_1\},\{P_2\},\{P_3,P_6\},\{P_4\},\{P_5\},\{P_7\},\{P_8,P_9\},\{P_{10}\}\}$. $L_{C-\{PCOS\}}(X)=\{P_5\}$, $U_{C_1-\{PCOS\}}(X)=\{P_3,P_5,P_6,P_8,P_9\}$ and $B_{C_1-\{PCOS\}}(X)=\{P_3,P_6,P_8,P_9\}$. Therefore, the corresponding nano topology is $\tau_{C_1-\{PCOS\}}(X)=\{\phi,U,\{P_5\},\{P_3,P_5,P_6,P_8,P_9\},\{P_3,P_6,P_8,P_9\}\}$ and the basis is $\beta_{C_1-\{PCOS\}}(X)=\{U,\{P_5\},\{P_3,P_6,P_8,P_9\}\}=\beta_{C_1}(X)$.

As in case I, the reducts from C_1 are OW, PP, BW, FH and PCOS and CORE ={OA}, which is minimal.

4. Odservation:

Although "overweight, over age 28, had gestational diabetes during a past pregnancy , have given birth to a baby weighing more than 4kg. , have a family history of type 2 diabetes and have Polycystic Ovary Syndrome" are the risk factors of having diabetes during pregnancy period, we observed that, a woman got pregnant over the age of 28 is the key factor to have gestational diabetes.

5. Conclusion :

Women in this world have a lot of problems during their pregnancy period. Childbirth for a woman is like re-birth. In this paper, we found that getting pregnant after the age of 28 will increase the risk of gestational diabetes. Getting married at the right age can reduce this pregnancy risk. Moreover proper diet and physical exercises can reduce the risk of having any type of diabetes.

Acknowledgement :

The authors sincerely thank the referee for the valuable comments and suggestions.

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