INTRODUCTION

Diabetes Mellitus is a disorder which is characterized by increased blood sugar (glucose) level resulting from defects in insulin secretion, insulin action, or both. Diabetes Mellitus is present in 11.3% of persons over age of 20 years in the United States, and 26.9% of those over the age of 65 years. Figure shows the increase in diabetics to 29.1 million from 25.8 million in 2010, according to National Diabetes Statistics Report, 2014. Diabetes is predicted to become the 7th leading cause of death in world by the year 2030 according to WHO. 90% of cases are Type 2 DM which is preventable with lifestyle modifications.

RISK FACTORS AS INPUTS

<table>
<thead>
<tr>
<th>Family History of Diabetes Mellitus</th>
<th>Risk increases if parent or sibling has Type 2 DM or if one has Prediabetes which is a precursor to Type 2 DM (Blood Sugar more than normal but less than definition of Diabetes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>About 30% of men and 70% of women who have diabetes are obese. Body Mass Index which is weight/square of height, if more than 30 indicates obesity.</td>
</tr>
<tr>
<td>Lack of Physical Activity / Exercise</td>
<td>Life style modification, including a balanced hypocaloric diet to achieve 7% weight loss in overweight patients and regular exercise of &gt; 150 minutes per week, is recommended for persons with prediabetes to prevent progression to type 2 DM.</td>
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<tr>
<td>Age more than 45 years</td>
<td>Increasing age increase risk of diabetes.</td>
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<tr>
<td>Dyslipidemia/Abnormal lipid level</td>
<td>Increased blood cholesterol &gt; 240 mg/dl increases risk of diabetes mellitus and cardiovascular disease. Total cholesterol should be &lt; 150 mg/dl.</td>
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<tr>
<td>Hypertension</td>
<td>Chronic high blood pressure &gt; 140/90 mm hg increases risk to diabetes, heart attack, stroke. Blood pressure target in diabetics is &lt; 130/80 mm hg.</td>
</tr>
<tr>
<td>Polyuria</td>
<td>Increased blood sugar spills in urine and kidneys secrete excess water to dilute excess sugar resulting in increased frequency of urination.</td>
</tr>
</tbody>
</table>

METHOD AND SURVEY

- We started with seven risk factors of diabetes with aim of developing a system using fuzzy logic which can be used by patients themselves to assess their own risk factors of Diabetes Mellitus and reach their primary care physician for diabetes screening.
- We did a survey on general population regarding seven risk factors, from which we developed a system for diabetes risk factor stratification using fuzzy logic by defining the rules.

MATLAB APPROACH USING FUZZY LOGIC

- Define the linguistic variables and terms (initialization)
- Construct the membership functions (Initialization)
- Construct the rule base (initialization)
- Convert input data to fuzzy values using membership functions
- Evaluate the rules in the rule base (inference)
- Convert the output data to non fuzzy values

RESULTS & ANALYSIS

- Correlation factor is 0.816 via Sugeno Inference System
- System was developed through which a patient would assess his own risk factors, get his probability of getting diabetes and should see his primary care for early diabetes screening.

CONCLUSION & FUTURE WORK

- The system needs further and larger evaluation to establish its safety and efficacy.
- To get input from different physicians to define rules for developing a system using fuzzy logic.
- To do more surveys on populations with different age, race, ethnicity.
- To test the system on larger number of population.
- To make a standardized system which can be used by everyone for their risk factor stratification.