

Diabetes and Absentmindedness

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It's morning and about time for office, the husband asks the wife, 'Have you seen my wallet?', to which the wife replies, 'it's in the same place you kept yesterday after you got back from office'. The husband tries to remember where he left it last night and according to his wife, it's the same place he's been leaving the wallet every night after coming back from office. But, he can't seem to remember! He then thinks if he's had his anti-diabetic medication before he's had his breakfast. With a bit of embarrassment, he asks his wife if she remembers him taking the medication to which she says '*Haanji*, you had taken your tablets before having the hot dosas I made for you, you forgot so soon? And the wallet is on the table beside you if you didn't find it already.'

On his way to the office, he tries to recollect the previous day and he could remember most of the things that involved him, but there were some fine details which he kept forgetting time and again. He said to himself, 'Have I grown too old so soon? I am just 47 years, my father used to be so sharp at remembering things, how come I don't have that quality?'

As years progress and we age, we tend to forget things, sometimes insignificant but, at times, small details that are important to us personally. This is a natural process, but when you have a lifestyle disease like Type 2 Diabetes, then losing your memory tends to be on a higher rate, especially when there is an improper management of diabetes with the prescribed medication and proper diet.

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A notification from the Government of India, Ministry of Human Resource & Development was put up to all the universities, medical colleges and research institutions to take up studies that will benefit the geriatric population of our country. This was the inspiration to take up the particular research topic as India is a country that's in the top 5 nations to have a large population of diabetics that too being diagnosed at ages as young as 30 years. Now, there are many comorbidities associated with diabetes like kidney diseases, loss of vision, general weakness, but memory impairment or forgetfulness is one that is less addressed in general which affects the Quality of Life of the patient.

Memory in the animals is measured using Barn's Maze and Novel Object Recognition Test (NORT). Barn's Maze is composed of a circular platform and 12 holes towards the edges of the platform. Out of the 12 holes, only one hole has an escape box where the animal can go and sit comfortably. The animals are placed in the centre of the Barn's Maze and are exposed to a high intensity of light which makes them search for the escape box as rats prefer dark places when compared to areas exposed to light.

We train the animals to find the escape box within a minute with the help of clues placed in strategic positions. The animals are also trained to commit a lesser number of errors, this is when we observe how many times the rats dip their head in the other holes not containing the escape box which is usually only 1 or 2 errors.

In Novel Object Recognition Test, the animals are kept in a small enclosure and are exposed to two similar objects and we observe the time that they spend on each object. After a specific time, one of the objects is removed and a novel/new object, that is not similar to the older one, is introduced. We then observe how much time the animal spends on the new object, the more time it spends is translated as having a better memory.

Once the animals get trained, they are induced with diabetes using chemicals, which causes the destruction of the pancreas the insulin producer of the body insulin being responsible for the reduction of the raised glucose in the body. The prolonged elevated glucose levels in the animals are allowed to continue for few days to produce signs of memory loss when they are judged on the Barn's Maze, where the animals, which previously took only one minute to find the escape box, takes more than 2 or 3 minutes and sometimes doesn't even find the escape box, they also tend to commit a higher number of errors usually five or more; and in the NORT the diabetic animals prefer the older object as when compared to the newly introduced object in the enclosure as it spent more time with the older object, this all translates to memory loss according to scientific findings.



The animals, when treated with anti-diabetic drugs like Pioglitazone, showed a little improvement in finding the escape box and committed lesser errors in the Barn's Maze while in the NORT, the animals showed a preference to the new object, but when we treated them with marketed anti-diabetic herbal remedy, they showed a good improvement in memory as they were able to find the escape box within 2 minutes or less and reduced the number of errors committed to 3 or 2 errors while the preference for the new object also was higher in the NORT.

Hence, we are of the opinion that the improvement is mainly due to the antioxidant components in the herbal remedy given to the animals. We also observed a better control over the blood-glucose levels in the animals given with the herbal remedy so this, along with the antioxidants, and the micro minerals and nutrients present would be the prime reason for the improvement in the ability of the animals to retain memory better when compared to the non-treated animals.

This result is indicative that there is indeed a memory impairment occurring in mismanaged diabetic condition and it can be rectified with the help of herbal remedies which contain antioxidant components and proper medication and that management of diabetes not only improves the diabetic condition but also the overall Quality of Life of the patients.