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Research Article

To Conduct a Prospective Study on Pioglitazone Induced Kidney Injury in Tertiary Care Hospital

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Abstract

Conducting a prospective study on kidney impairment caused by pioglitazone at tertiary care hospitals is the study's goal. The goal is to assess Pioglitazone, mortality, quality of life, and the degree of the medication's harmful side effects in diabetic patients. According to the "Pioglitazone-induced kidney injury" prospective study. Out of 350 trial participants, prolonged pioglitazone use in diabetic patients has been shown to raise serum creatinine levels by up to 11%. Additionally, individuals who have been using pioglitazone for six to ten years are more likely to experience renal injury, with males in the 50–60 year age range being the most common victims.

Keywords: Pioglitazone, diabetic, prospective, tertiary care, hospital.

INTRODUCTION

It was Apollonius of Memphis who first used the term diabetes about 250–300 BC. When the sugary urine state was discovered by the ancient Greek, Indian, and Egyptian civilizations, the term diabetes mellitus was created. Hyperglycemia, a collection of metabolic illnesses known as diabetes mellitus, is caused by deficiencies in either insulin action or secretion, or both. Greek Diabetes means "syphon," meaning to pass by, and Latin Mellitus means "sweet" are the roots of the phrase Diabetes Mellitus. Over time, hyperglycemia can cause several organs, including the kidney, heart, kidney, eyes, nerves, and blood vessels, to fail, malfunction, or be destroyed[1]. Metabolic defects are caused by reduced insulin synthesis to achieve the proper response and/or insulin resistance in particular tissues, primarily the liver, adipose tissue, and skeletal muscles at the level of effector enzymes, signal transduction system, and/or insulin receptors. Genes are also responsible for these abnormalities. The assessment of hyperglycemia involves multiple morbidities. These include malformations that grow resistant to the effects of insulin, as well as autoimmune destruction of the pancreatic beta cells, which leaves the body without insulin. A decrease in tissue response to insulin or insufficient insulin synthesis can lead to abnormalities in the metabolism of proteins, fats, as well as carbohydrates in hyperglycemia. The extremities of manifestations depend on the time span of the hyperglycemia. Some patients of hyperglycemia are less symptomatic mainly people who are having type – 2 hyperglycemia during the initial stage of disorder[2]. Symptoms include polyurea, polyphagia, polydipsia, weight loss, blurred vision. Unrestrained hyperglycemia results to stupor, coma, and leads to death if not treated due to ketoacidosis or rare from non ketotic hyper osmolar syndrome. Chronic complications of hyperglycemia involve retinopathy with possible loss of eyesight, neuropathy can cause the renal damage, peripheral neuropathy leads to foot ulcers, dissever, diabetic neuropathy osteoarthropathy, and autonomic neuropathy leads to GI, urogenital, cardiovascular, peripheral arterial and cerebro vascular disease. High blood pressure and deficiency of lipoproteins are normal in patients who are suffering from hyperglycemia[3].

Etiology

Alpha cells that secrete glucagon as well as beta cells that produce insulin make up the majority of the endocrine cells found in the pancreatic islets of Langerhans. Beta and alpha cells alternate in their secretion depending on the glucose's occupant. Unsuitably skewed glucose levels occur when there is an imbalance between glucagon and insulin[4]. Hyperglycemia

is caused by insulin resistance in diabetes, which results in neither producing insulin nor weakening its effects.

Type 1 DM is occurs due to damage of beta cells in the pancreas due to auto immune reactions which results in the low levels of insulin or out of insulin.

Type 2 DM is seen most commonly in elderly and obesity people. It occurs mainly due to variation of insulin levels and insulin sensitivity which leads to functional deficiency of insulin.

Type 2 DM involves a more complex interaction between genetics and lifestyle. There is clear evidence suggesting the Type 2 DM is has a stronger hereditary profile as compare to Type 1 DM. The majority of patients with the disease have at least one parent of Type 2 DM[5].

Epidemiology

In every 11 adults 1 person is having hyperglycemia (mainly type 2) throughout the world. The onset of Type 1 DM is starts from birth and ends at age of 4 to 6 years and again from 10 – 14 years. The prevalence of people with Type 1 DM underage of 20 is 2.3 per 1000. Most of the autoimmune diseases occurs in females but there is no gender difference for onset of Type 1DM at young age. The ratio of onset of Type1DM is 3 :2 (male to female). The incidence of Type 1DM is increasing globally and raising to 2 to 5 % yearly in Europe, Asia, Middle East. Nearly 2% of incidence is increases in youth of US[6].

The Onset of Type 2DM is usually occurs in the later life through obesity in adolescents has lead to an increase in Type 2DM in younger population. Upto 9% of total population are having Type 2DM in US 25% in those are above 65 years.

The International Diabetes Foundation evaluates that 1 in 11 adults if age 20 - 25 yrs had hyperglycemia throughout the world in 2015. The specialists anticipate that the prevalence of hyperglycemia is going to increase from 415 to 642 million by 2040 with increase in population change over from low to middle income levels. Type 2DM is varies among the community groups and it is 2 to 6 times more common in blacks, Native Americans, Pima Indians and Hispanic Americans compare to whites in US. Not only community plays a major role in Type 2DM environmental factors also risk factors for Type 2DM. For example,Pima Indians in USis more likely to develop Type 2DM when compare to Pima Indians in Mexico (38% vs 6.9%)[7].

MATERIALS AND METHODS

Study site

The current study was carried out in the general medicine department of the 1000-bed tertiary care teaching hospital.

Study design

We used a prospective observational study design for our research[8].

Source of data

Blood samples, patient case papers, and also patient interviews.

Study regulation

350 members, including those who are not patients.

Patient selection criteria

The inclusion and exclusion criteria were used to determine the patients who were enrolled in the trial[9].

a. Inclusion criteria [10]

- Diabetes Patients on Pioglitazone with hypertension as well as kidney co-morbidities are included.
- The study includes patients who are willing to participate.
- Patients between the ages of 35 and 90 are eligible.

b. **Exclusion criteria**

- Patients under the age of twenty are not eligible.
- Mothers who are pregnant or nursing are not allowed.
- Patients using insulin are not allowed[11].
- Patients with COVID-19 are not accepted.
- Individuals who do not take pioglitazone are not eligible.
- Patients who decline to take part in the research will not be accepted.
- Hepatic and central nervous system impairment patients are not accepted.
- The study's qualified patients will provide their informed permission[12].

Study procedure

1. The Institutional Ethics Committee of Saastra College of Pharmacy, Nellore, and the Department of General Medicine, ACSR Medical College & Govt. General Hospital, Nellore, approved the study after a common data entry format was created for the collection of patient information.
2. The study's eligible participants provided information on their demographics, history of diabetes and hypertension co-morbidities, use of pioglitazone, and social history in diabetes patients[13].
3. After starting treatment, the patient will have a three-month follow-up to determine the prognosis.
4. The impact of pioglitazone on patients with diabetic kidney damage will be tracked, and information will be gathered.
5. A questionnaire containing information about any drinking, smoking, and other behaviours as well as social history will be used[14].
6. Forms for patient counselling were provided.
7. Patients get counselling regarding the use of pioglitazone and lifestyle changes related to their complaints at each follow-up visit[15].
8. Patients are followed up with continuously, the effects of pioglitazone are monitored, and quality of life is assessed.
9. Formatting the results, sending them in, and publishing the data in suitable journals with high impact and indexing[16].

RESULTS AND DISCUSSION

Table 1: Study population distribution according to elevated serum creatinine levels

Total study population	Elevated serum creatinine levels	Percentage of incidence
350	40	20 %

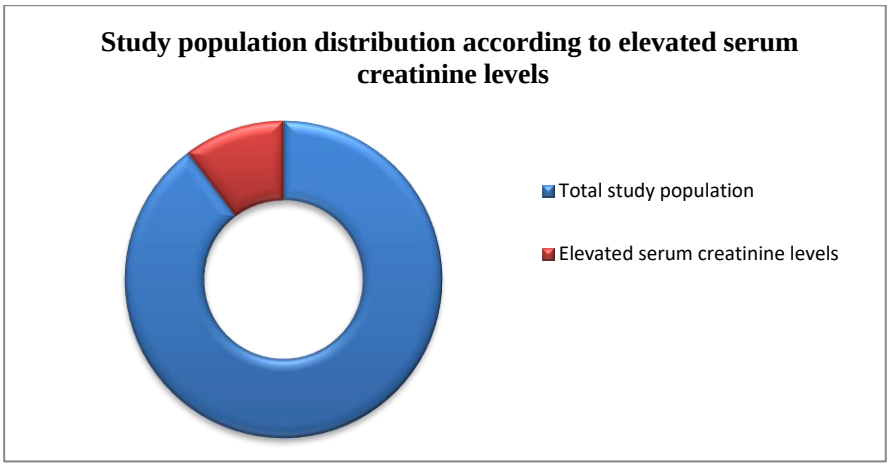

Figure 1: Study population distribution according to elevated serum creatinine levels

Thirty of the 350 participants had elevated serum creatine levels; the remaining subjects' serum creatine levels were normal.

The 350 participants in the study are shown in blue, while the number of people with elevated serum creatinine readings is shown in red.

Table 2: Study population distribution according to age group and length of pioglitazone use.

Age		Duration		
	1 – 5 yrs	6 – 10 yrs	11- 15 yrs	16 – 20 yrs
< 40 yrs M	_	_	_	_
F	1	_	_	_
40 – 50 yrs M	1	1	2	_
F	1	_	_	_
50 – 60 yrs M	2	1	6	_
F	_	_	_	1
60 – 70 yrs M	3	1	1	1
F	_	2	1	1
70 – 80 yrs M	1	1	_	_
F	_	_	_	_
80 – 90 yrs M	_	_	_	_
F	_	_	1	_

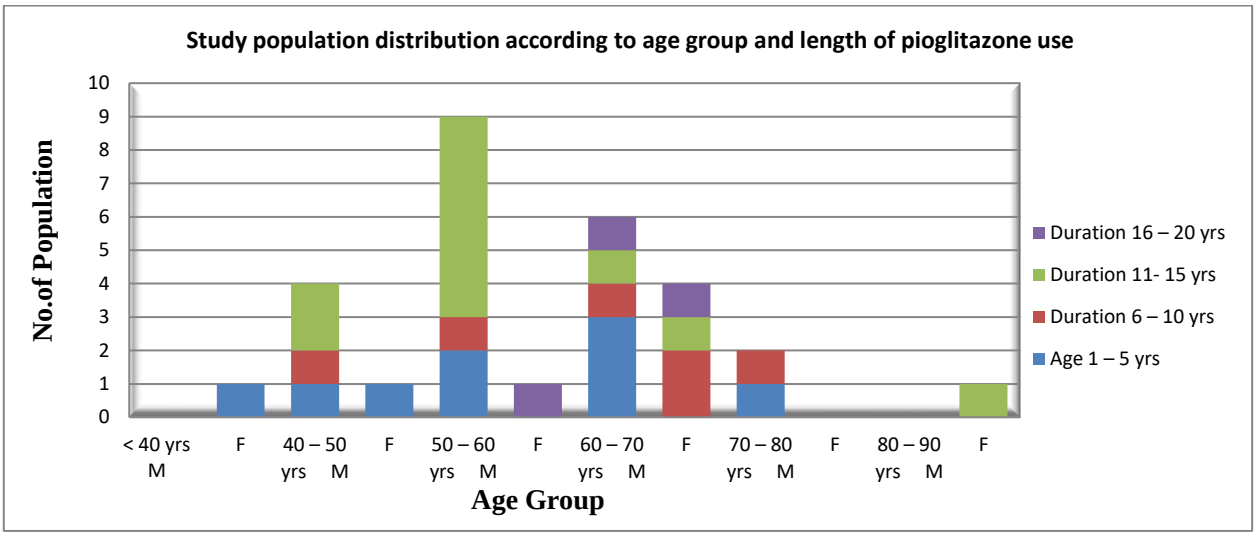

Figure 2: Study population distribution according to age group and length of pioglitazone use

Blue denotes a period of one to five years, red-six to ten years, green-eleven to fifteen years, and violet-sixteen to twenty years.

The Y axis shows the age range of the population, and the X axis shows the number of individuals at risk for kidney damage. Kidney injury is most frequently observed in people who have been using pioglitazone for 10 to 15 years. Males in the 50–60 year age range are more commonly affected.

Table 3: Age group as well as length of pioglitazone use (less than 5 years) were used to distribute the study population

Age		Duration			
	1	2	3	4	5
< 40 yrs M	_	_	_	_	_
F	2	_	_	_	_
40 – 50 yrs M	_	1	_	1	_
F	_	_	_	_	_
50 – 60 yrs M	_	_	1	1	_
F	_	_	_	_	_
60 – 70 yrs M	_	1	1	_	1
F	_	_	_	_	_
70 – 80 yrs M	_	_	_	_	1
F	_	_	_	_	_
80 – 90 yrs M	_	_	_	_	_
F	_	_	_	_	_

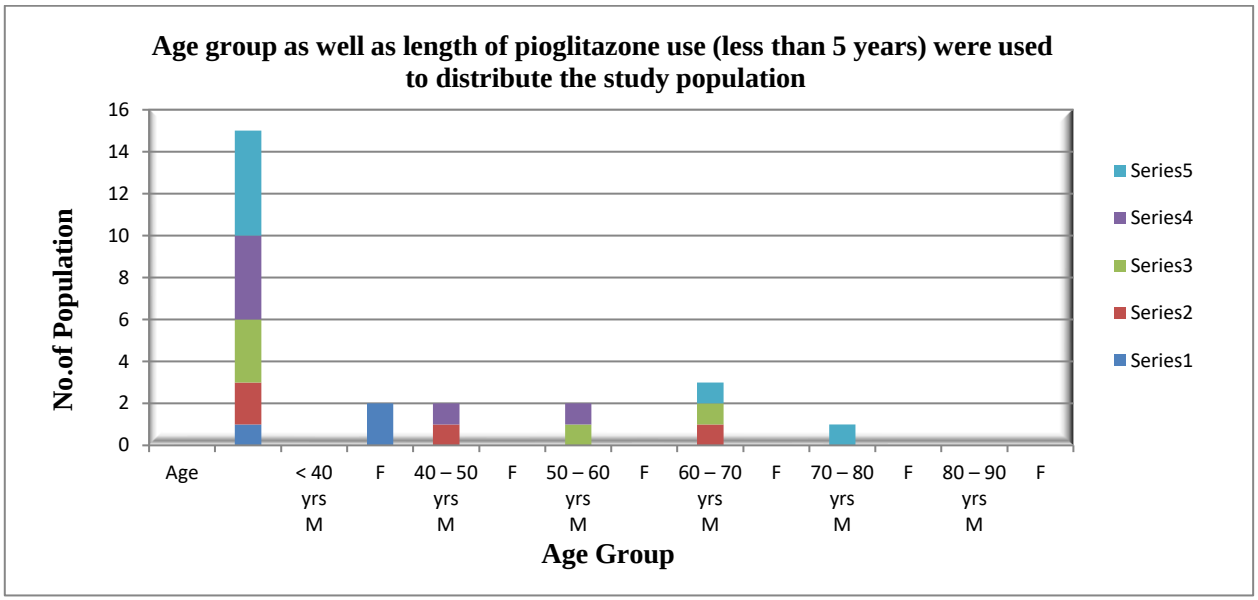

Figure 3: Age group as well as length of pioglitazone use (less than 5 years) were used to distribute the study population

The Y axis shows the number of patients, and the X axis shows age.

One year is indicated by the colour blue, two years by the colour red, three years by the colour green, and sixteen to twenty-four years by the colour violet. Five years is shown by the light blue colour.

The Y axis shows the age range of the population, and the X axis shows the number of individuals at risk for kidney damage.

Table 4: Study population distribution according to age group and length of pioglitazone use (6 – 10 yrs)

Age		Duration			
	6	7	8	9	10
< 40 yrs M	_	_	_	_	_
F	_	_	_	_	_
40 – 50 yrs M	_	_	_	_	1
F	_	_	_	_	_
50 – 60 yrs M	_	_	1	_	_
F	_	_	_	_	_
60 – 70 yrs M	_	_	_	_	1
F	_	_	_	_	2
70 – 80 yrs M	_	_	_	_	1
F	_	_	_	_	_
80 – 90 yrs M	_	_	_	_	_
F	_	_	_	_	_

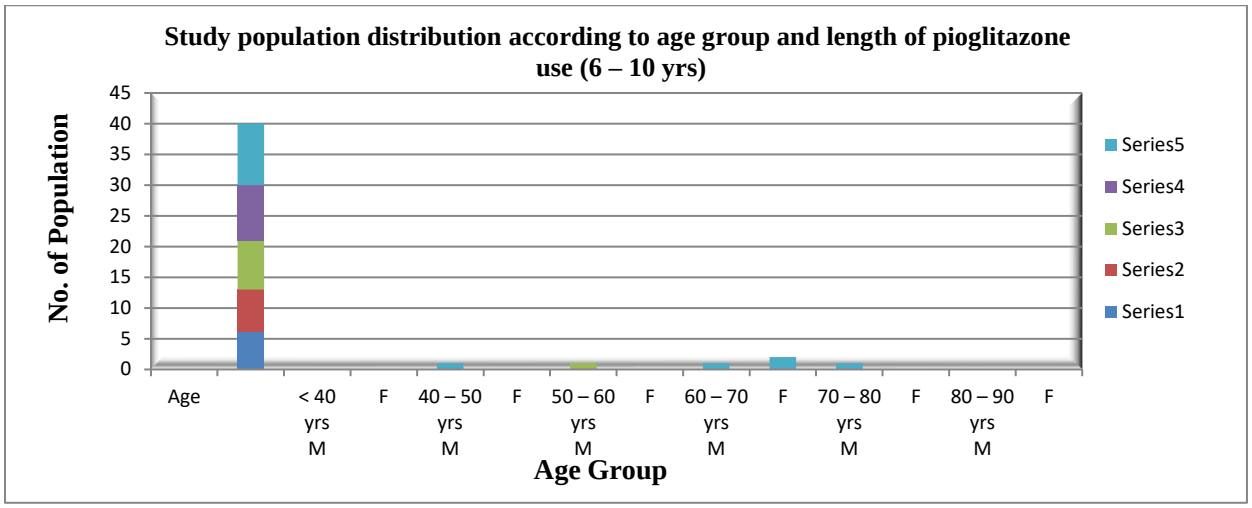

Figure 4: Study population distribution according to age group and length of pioglitazone use (6 – 10 yrs)

The Y axis shows the number of patients, and the X axis shows age.

The colours blue, red, green, and violet denote lengths of six, seven, nine, and ten years, respectively. The light blue tint denotes a duration of ten years.

The Y axis shows the age range of the population, and the X axis shows the number of individuals at risk for kidney damage.

Table 5: Study population distribution according to age group and length of pioglitazone use (11–15 years)

Age		Duration				
		11	12	13	14	15
< 40 yrs	M	_	_	_	_	_
	F	_	_	_	_	_
40 – 50 yrs	M	_	_	_	_	2
	F	_	_	_	_	_
50 – 60 yrs	M	_	_	_	2	4
	F	_	_	_	_	_
60 – 70 yrs	M	_	1	_	_	_
	F	_	1	_	_	_
70 – 80 yrs	M	_	_	_	_	_
	F	_	_	_	_	_
80 – 90 yrs	M	_	_	_	_	_
	F	_	_	_	_	1

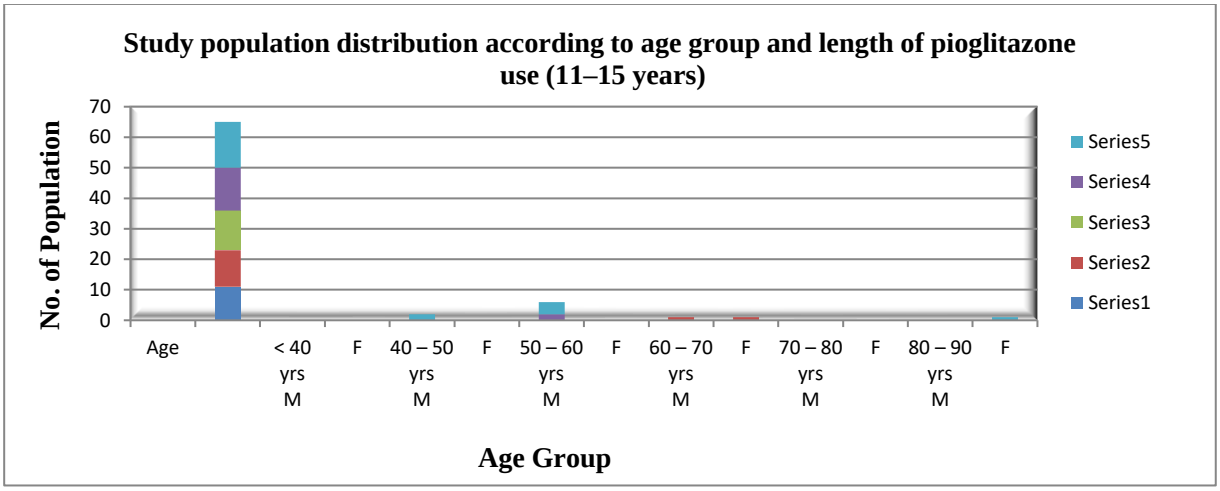

Figure 5: Study population distribution according to age group and length of pioglitazone use (11–15 years)

The Y axis shows the number of patients, and the X axis shows age.

The periods in blue, red, green, violet, and light blue denote 11, 12, 13, and 15 years, respectively. The Y axis shows the age range of the population, and the X axis shows the number of individuals at risk for kidney damage.

Table 6: Distribution of study population based on age group and duration of Pioglitazone usage (16 – 20 yrs)

Age		Duration			
	16	17	18	19	20
< 40 yrs M	_	_	_	_	_
F	_	_	_	_	_
40 – 50 yrs M	_	_	_	_	_
F	_	_	_	_	_
50 – 60 yrs M	_	_	_	_	_
F	_	_	_	_	1
60 – 70 yrs M	_	_	_	_	1
F	_	_	_	_	1
70 – 80 yrs M	_	_	_	_	_
F	_	_	_	_	_
80 – 90 yrs M	_	_	_	_	_
F	_	_	_	_	_

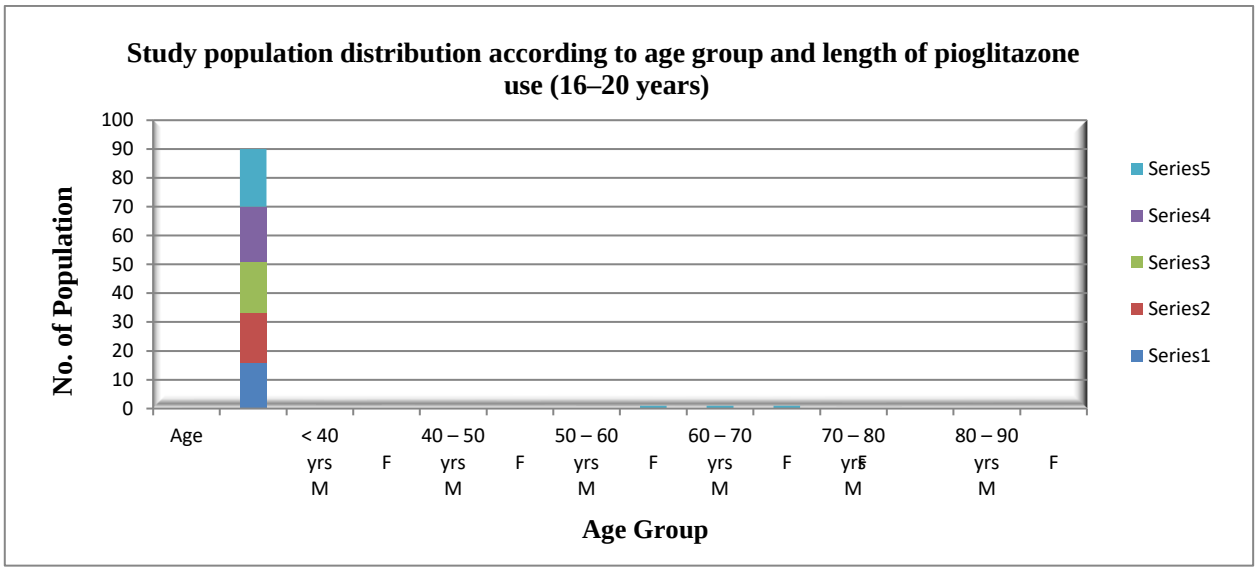

Figure 6: Study population distribution according to age group and length of pioglitazone use (16–20 years)

The Y axis shows the number of patients, and the X axis shows age.

Blue denotes sixteen years, orange, seventeen, eighteen, and nineteen years, yellow, nineteen, and twenty years, are indicated by the colours. Light blue denotes twenty years.

The Y axis shows the age range of the population, and the X axis shows the number of individuals at risk for kidney damage.

CONCLUSION

According to the prospective study "Kidney injury caused by pioglitazone." The long-term use of pioglitazone in diabetic patients has been found to raise serum creatinine levels by up to 11% in 350 trial participants. Additionally, patients on pioglitazone for six to ten years have a higher risk of kidney injury, which is usually observed in males between the ages of fifty as well as sixty.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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