Introduction
Insufficient insulin secretion, insulin resistance, excessive glucose generation, and/or aberrant lipid and protein metabolism are all factors that play a role in the pathogenesis of diabetes. Diabetes patients are at an increased risk for cardiovascular, peripheral vascular, and cerebrovascular illness. Diabetes affects one out of every five persons in various Indian cities. Early detection and implementation of appropriate therapeutic strategies result in the anticipated glycaemic outcomes and avoid vascular complications. Although there are various types of short, intermediate, and long acting insulins that can be administered with a syringe or a pen, optimal administration technique and procedures are critical for their effectiveness. India is rapidly emerging as the diabetes capital of the world. India has an estimated 77 million people with diabetes, which makes it the second most affected in the world. India leads the world with the largest number of diabetic patients earning the dubious distinction of being termed the “diabetes capital of the world.”

Symptoms of Type 1 and Type 2 Diabetes
The classic symptoms of diabetes such as polyuria, polydipsia and polyphagia occur commonly in type 1 diabetes, which has a rapid development of severe hyperglycaemia and also in type 2 diabetes with very high levels of hyperglycemia. Severe weight loss is common only in type 1 diabetes or if type 2 diabetes. Because of the disease’s continuous course, many people ignore the signs and symptoms of diabetes. Many people are unaware that damage might begin several years before symptoms appear. This is unfortunate because early detection of symptoms can assist to quickly treat the condition and prevent vascular problems.

Insulin
Insulin plays a critical role in long-term diabetes, including medication failure, diabetic micro and macrovascular complications, and beta cell failure. Insulin is obtained from pork pancreas or is made chemically identical to human insulin by recombinant DNA technology or chemical modification of pork insulin. Insulin from pigs is being replaced with human insulin made with recombinant DNA technology. Insulin analogs have been developed by modifying the amino acid sequence of the insulin molecule.

Storage of Insulin
Insulin is available in rapid-, short-, intermediate-, and long-acting types that may be injected separately or mixed in the same syringe. Vials of insulin not in use should be refrigerated. Extreme temperatures (<36 or
Administration of Insulin
Injections are made into the subcutaneous tissue. Most individuals are able to lightly grasp a fold of skin, release the pinch, then inject at a 90° angle. Thin individuals or children can use short needles or may need to pinch the skin and inject at a 45° angle to avoid intramuscular injection, especially in the thigh area. Routine aspiration (drawing back on the injected syringe to check for blood) is not necessary. Particularly with the use of insulin pens, the needle should be embedded within the skin for 5 s after complete depression of the plunger to ensure complete delivery of the insulin dose. Insulin may be injected into the subcutaneous tissue of the upper arm and the anterior and lateral aspects of the thigh, buttocks, and abdomen (with the exception of a circle with a 2-inch radius around the navel) [6].

Insulin formulations when mixed may be used immediately or stored for future use.

Insulin site reactions
Insulin site reactions are common local adverse events of insulin therapy. Lipodystrophy (LD), often caused by repeated reuse of needles, manifests as a localized lesion at the repeated injection site. If needles are reused or used improperly, it can also result in pain with bleeding and bruising, chances of breaking off and lodging under the skin, risk of contamination, infection, dosage inaccuracy. If bruising, soreness, welts, redness, or pain occur at the injection site, the patient’s injection technique should be reviewed by a physician or diabetes educator. Painful injections may be minimized by the following:

- Injecting insulin at room temperature.
- Making sure no air bubbles remain in the syringe before injection.
- Waiting until topical alcohol (if used) has evaporated completely before injection.
- Keeping muscles in the injection area relaxed, not tense, when injecting.
- Penetrating the skin quickly.
- Not changing direction of the needle during insertion or withdrawal.
- Not reusing needles.

Recapping, bending, or breaking a needle increases the risk of needle-stick injury and should be avoided. Insulin syringes and pens, needles, and lancets should be disposed of according to local regulations.

Mixing of insulin
In some patients, a combination of rapid- or short-acting and intermediate- or long-acting insulins will result in a more normal glycemia than a single insulin. Insulin products come in a variety of formulations and particle size ranges. When rapid-acting and ultralente insulins are mixed, the rapid-acting insulin’s beginning of action is not slowed. When rapid-acting and protamine-stabilized insulin (NPH) are mixed, the absorption rate decreases slightly but not the total bioavailability. However, in clinical trials, the postprandial blood glucose response was comparable.

- Patients who are well controlled on a particular mixed-insulin regimen should maintain their standard procedure for preparing their insulin doses.
- No other medication or diluent should be mixed with any insulin product unless approved by the prescribing physician.
- Insulin glargine should not be mixed with other forms of insulin due to the low pH of its diluent.
- Use of commercially available premixed insulins may be used if the insulin ratio is appropriate to the patient’s insulin requirements.
- Currently available NPH and short-acting insulin formulations when mixed may be used immediately or stored for future use.
- Rapid-acting insulin can be mixed with NPH, lente, and ultralente.
- When rapid-acting insulin is mixed with either an intermediate- or long-acting insulin, the mixture should be injected within 15 min before a meal.

Materials and Method

Study site
It is a survey based cross sectional study conducted through online as well as offline modes among diabetic patients consuming insulin in Kerala.

Study design:
cross-sectional study

Data collection method
- A questionnaire will be prepared and pilot study will be conducted by circulating the tools. Also, the questionnaire will be validated by experts.
- Based on the pilot study and validation, necessary modifications will be done.
- Finally, the questionnaire will be circulated through online and offline modes to diabetes patients in Ernakulam district and data will be collected.

Sample size: 200-300 [19, 20]

Study Criteria:
Selection of study population:

Inclusion criteria:
- Patients taking insulin.

Exclusion criteria:
- Patients with diabetes who are taking only Oral hypoglycemic agents.
- Those patients who are not willing to cooperate.
Data Analysis
All the data obtained were subjected to analysis by converting into percentage; the data thus compiled was used as the base for final result and discussion.

Result and Discussion
In this research work, a total of 213 cases were included and study population consisted of diabetic patients (type I and type II) on insulin therapy in Kerala.

Histogram of age

<table>
<thead>
<tr>
<th>Age group</th>
<th>Frequency</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30</td>
<td>18</td>
<td>8.2</td>
</tr>
<tr>
<td>30-50</td>
<td>136</td>
<td>61.8</td>
</tr>
<tr>
<td>50-70</td>
<td>62</td>
<td>28.2</td>
</tr>
<tr>
<td>&gt;70</td>
<td>4</td>
<td>1.8</td>
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</tbody>
</table>

Patients experiencing hypoglycaemia during insulin therapy
Majority of the patients (57.3%) experienced hypoglycaemia often during insulin use. Only 17.3% patients never experienced hypoglycaemia.

Storage of insulin vial/catridge

About 51.6% patients were educated by nurses regarding insulin administration technique while 25.6% of them were educated by doctors. Pharmacists were only able to educate 17.6% of diabetic patients about insulin usage technique.
Conclusion
This study was intended to assess the knowledge and practice of insulin administration including storage techniques among patients with diabetes. The maximum number of the patients were in the age group of 30-50 (61.8%). During insulin use, the majority of the patients (57.3%) had hypoglycemia often. Only 17.3% of patients have never had hypoglycemia. Among 213 study cases, 54.4% of patients were males and 45.6% patients were females. Most of the patients stored insulin in refrigerator and the opened insulin vials were stored for about 28 days. For the patients the major source of knowledge regarding insulin administration was provided by nurses (51.6%), doctors (25.6%) and pharmacists (17.6%). Most of the patients used syringes for the administration of insulin (58%). About 169 (77.2%) patients were about the correct insulin site to administer while 50 (22.8%) of them were not aware of it. It was also found that 131 patients knew that 131 patients knew shaking of insulin before use.

On analysing the site of insulin injection practices, 169 (77.2%) patients were about the correct insulin site to administer while 50 (22.8%) of them were not aware about it. It was also found that 131 patients knew where to inject insulin properly while 88 patients didn’t knew about it. Shaking of insulin before use

Shaking of insulin before use

<table>
<thead>
<tr>
<th>DEVICES</th>
<th>FREQUENCY</th>
<th>PER CENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYRINGE</td>
<td>127</td>
<td>58</td>
</tr>
<tr>
<td>PEN</td>
<td>71</td>
<td>32.4</td>
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<tr>
<td>BOTH SYRINGE AND PEN</td>
<td>11</td>
<td>5</td>
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<tr>
<td>OTHERS</td>
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<td>2.7</td>
</tr>
</tbody>
</table>

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Conflict of interest
No Conflict of interest

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Not Required

Reference
2. https://www.thewellproject.org/hiv-information/diabetes


