

Insulin Adherence in Adolescents with Type 1 Diabetes Mellitus

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Abstract

Adherence to medication, especially insulin, is a key contributor to diabetes treatment outcomes. Lack of adherence is common among patients with type 1 diabetes mellitus (T1DM) ranging from 23% to 77%, with a higher frequency in developing countries. Poor adherence results in worse glycaemic control and increased mortality and morbidity due to diabetes complications. The objective of this study is to discuss insulin adherence among adolescents with T1DM. The review was conducted through search engines such as PubMed, Medline, Embase and Google Scholar. Search terms used were 'type 1 diabetes mellitus', 'insulin dependent diabetes mellitus', 'Juvenile diabetes mellitus', 'adherence', 'compliance', 'non adherence', 'barriers', 'omission', 'medical adherence', 'adolescents', 'teenagers' and 'insulin'. T1DM is challenging for adolescents due to its lifelong treatment regimens. Educational programmes and specific interventions which can improve affordability, accessibility and administration of insulin should be implemented to improve insulin adherence among adolescents.

Keywords: Adherence, adolescence, insulin, type 1 diabetes mellitus

Life is not over because you have diabetes. Make the most of what you have, be grateful.

Dale Evans

INTRODUCTION

Type 1 diabetes mellitus (T1DM) is a form of diagnosis of diabetes (DM) that results from autoimmune destruction of insulin-producing beta cells of the pancreas. India is housing about 97,700 children with T1DM.^[1] It is estimated that T1DM probably accounts for 5–10% of all diagnosed diabetes. In India, the average prevalence of T1DM is believed to be 10.20 cases/100,000 persons each year.^[2]

The diagnosis of diabetes (DM) at a young age is always stressful for both patient and family. Insulin therapy is the gold standard for treating T1DM which is caused by a complete lack of this hormone. Lifelong administration of exogenous insulin is needed for the treatment of T1DM.^[3] The main goal of the treatment of T1DM in children and adolescents is maintenance of near-normoglycaemia through insulin therapy, avoidance of complications and prevention of long-term micro-vascular and macro-vascular complications.^[4]

For the management of T1DM, frequent blood sugar monitoring and insulin administration along with lifestyle modification is needed [Figure 1].^[5] Most paediatric T1DM patients receive insulin through injections, and it is assumed that they know how to do so properly. Guidelines and recommendations exist on how to inject correctly,^[4] but little is known regarding the actual adherence of diabetic paediatric patients to these recommendations.

According to the World Health Organization, the treatment adherence is the extent to which a person's behaviour – taking medication, following a diet and/or executing lifestyle change – corresponds with the agreed recommendations from a healthcare provider.

Insulin adherence may be explained as giving the correct dose at the right time and/or frequency in accordance with a mutually agreed-upon treatment regimen.^[6,7]

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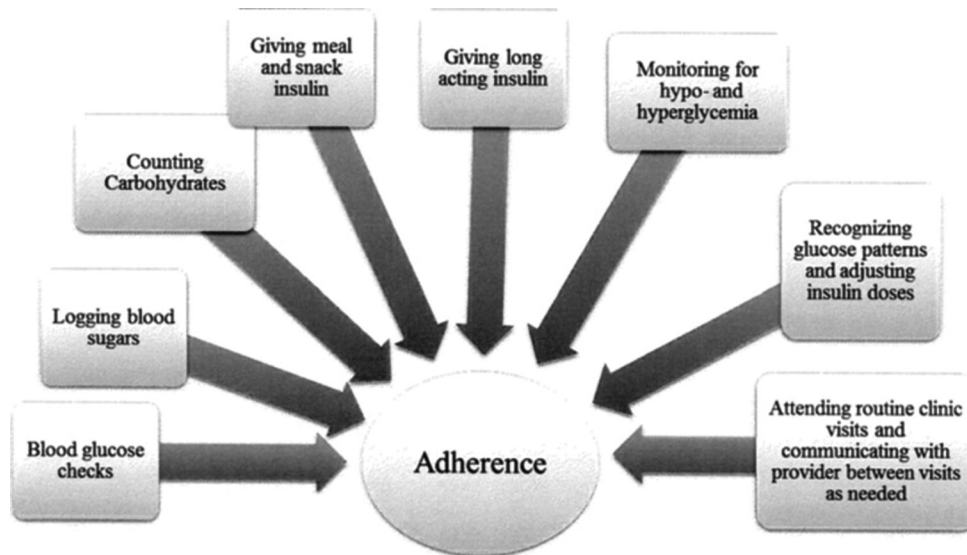


Figure 1: Type 1 diabetes treatment regimen tasks associated with adherence. Adapted from Jaser *et al.* (2016)

Adherence to medication, especially insulin, is a key contributor to diabetes treatment outcomes. Lack of adherence is common among patients with type 1 diabetes (T1D) ranging from 23% to 77%, with a higher frequency in developing countries.^[1,8]

Elhenawy *et al.* (2022) found that among 26.25% of the studied cohort, age ranged from 6 to 18 years and was non-adherent to insulin therapy; non-adherent patients were significantly older ($P = 0.001$). Decreased maternal education level, decreased frequency of blood glucose monitoring and prolonged disease duration best predicted the occurrence of non-adherence among the studied subjects.^[9]

Adolescents, age group between 10 and 20 years, were significantly more likely to be in the lowest adherence category and had the highest HbA_{1c} levels compared with younger and older patients (both $P < 0.001$).^[10]

Peyrot *et al.*^[11] used an international telephone survey of 1530 insulin-treated subjects (180 with type 1 and 1530 with type 2 diabetes) and reported that 33% of subjects reported insulin omission/non-adherence with a mean of 3.3 days in the last month.

In adolescence, metabolic control deteriorated^[12] and had been associated with poorer adherence to the treatment. An objective measure of adherence is assessed by glucose monitoring (BGM), obtained by glucometer downloads, that may be more closely linked with glycaemic control,^[13] but it only captures one aspect of adherence. For example, a patient may check blood glucose frequently, but without using that information to make adjustments to insulin, glycaemic control will not be improved. A patient may write fake readings also. Poor adherence results in worse glucose control and increased hospital admissions of patients due to diabetes complications.

There is a decline in adherence to medications, lifestyle and self-care that occur when children with diabetes enter

puberty leading to uncontrolled T1DM.^[14] The pressures and changes of normal adolescent development can conflict with the self-esteem, restraint needed to age living with a chronic disease, and these tensions create a platform for significant personal and family stress and even mental illness.^[15]

Effective insulin therapy includes four main aspects: initiation, adherence, persistence intensification.^[16] Each of these requires the involvement of both patient and healthcare provider. The healthcare provider must recommend/prescribe insulin and patient must begin taking the medication. The healthcare provider must formulate an insulin regimen that patient can implement and adhere to that regimen. The healthcare provider must encourage the patients to continue the treatment and patient must be persistence in this. The healthcare provider must intensify the regimen when appropriate (increase dose and frequency of administration) and patients must accept and implement the intensified regimen.^[10] Unfortunately, there can be problem at any point of insulin therapy. The failures can be attributed to patients, some to health care worker due to complex treatment regimen.

Adolescents have the same exploration needs as their peers but they try to fit into the new social standards without adapting and integrating diabetes into their daily lives. For example, some teenagers, especially girls, reduce the dose of insulin to control their body weight.^[17]

Shame, depression and social isolation are feelings that most children and parents are confessing due to T1DM. Children feel different from the others and get afraid to tell about their condition to their friends and their surroundings.

One of the main areas where adolescents with T1D are greatly affected is in the context of public and social functions (i.e., school)^[18] Often times, insulin injections must be administered while at school, which can cause stress if the child feels singled out from his or her classmates. In summary,

diabetes management is a difficult and challenging task during childhood and adolescence, and these stressful challenges may play a role in the difficulties of managing diabetes during this developmental period.

BARRIERS TO INSULIN ADHERENCE

There are certain factors which act as barriers to insulin adherence. Barriers to adherence categorize into three factors by the American Diabetes Association. These are patient barriers, medication factors or system factors. Patient barriers include difficulty remembering to take medications, fear of taking medications, depression or health beliefs regarding medications. Medication regimen complexity, multiple daily dosing of medications, cost and side effects are all medication factors that may act as barriers to adherence. System factors include inadequate follow-up and support.^[19]

Other risk factors for non-adherence to insulin included younger age, low income, multiple injections,^[20] injection-related pain or embarrassment and feeling of interference with daily routine.^[21] Additionally, other factors like the socioeconomic status, duration of disease, type of medication, alcohol or tobacco use and associated co-morbidities are expected to influence medication adherence.^[22,23] Religious fasting plays a role in limiting patients' ability to comply with diabetes treatment. Farsaei *et al.*,^[24] 2014, identified that the common barriers by patients with diabetes (type 1 or type 2) were reactions of injection site, (90.2%), fear of hypoglycaemia (87.4%), injections being time-consuming (63.2%), interference with physical activity (61.6%) and lack of proper injection instructions (59.6%).

Peyrot *et al.*^[11] conducted a survey on 1530 subjects and reported that the main reasons for insulin omission/non-adherence were too busy (19%), followed by travelling (16%), skipped meal (15%), stress or emotional problems (12%), embarrassing to injecting in public (10%), challenging to take it at the same time every day (9%), forgot (7%), too many injections (6%), avoid weight gain (4%), regimen is too complicated (3.8%) and injections are painful (3%).^[16]

Many parents are so reluctant to follow instructions of health professionals regarding diabetic care of their children. They try new ways of treatment by giving children medicines or formulations that claim to cure diabetes, thereby avoiding prescribed medication by healthcare professionals. Non-insulin can lead to significant problems in adolescents' development and lead to stagnation.^[25]

Improving insulin adherence

There are various strategies for improving insulin adherence. Affordability, acceptability, accessibility and administration are the major issues faced with insulin usage.^[26]

- **Affordability of insulin:** Getting insulin is the main obstacle in children and adolescents belonging to lower socioeconomic strata in India. They obtain insulin either by purchasing or procuring it from the government hospitals. Providing insulin, syringes, glucometer at

low cost or at free cost will improve the adherence to treatment regimen.

- **Acceptability:** With improved diabetes, education regarding complications and avoidance of hypoglycaemia and acceptability of insulin has improved.
- **Accessibility:** Adolescents should be encouraged to administer insulin at school/colleges and public places.
- **Administration:** Correct administration of insulin involves using the right insulin, dose, regimen and technique. Storage of insulin remains a problem for people who do not own refrigerators. Proper techniques of storage should be explained.

Role of nurse in improving adherence

Research shows that nursing care is effective in increasing the ability of children with T1DM to self-manage their disease.^[27-29]

Communication

The nurse shall have a good interpersonal relationship with the patient. To successfully promote medication adherence and assess barriers to adherence, a solid communication skill set is required. Medication adherence requires patients to understand the disease process and how their medication works, be motivated to take their medication, and implement lifestyle and behavioural changes. With all this in mind, the nurse can approach discussions about adherence strategically.

Promoting health and minimizing complications

Nurses who care for children and adolescents, therefore, must be capable of evaluating the educational, behavioural, emotional and psychosocial factors that impact implementation of a treatment plan and must work with the individual and family to overcome barriers or redefine goals as appropriate.

Education of patients

When patients receive education regarding glycaemic control, they are more adherent to treatment and better at achieving glycaemic control. Education and information is the key to diabetes treatment. There are indications that educational interventions in children and adolescents with diabetes have a beneficial effect both on glycaemic control and on the psychology of their own and their social environment.

Various studies have shown that education provided by T1D education provided by diabetes nurses, including psychological as well as behavioural strategies, is effective in altering the lifestyle of patients, which results in a reduction in hospitalizations and associated costs because of improved glycaemic control.^[30,31]

Self-care activities

The nurses shall assist children and youth with T1DM to accept and participate in self-care activities to overcome the T1DM and hence minimizing the complications associated with it.

Workplace

Nurses should advocate for improved diabetes management in schools/college. The strategies that nurses could promote in schools include (1) allowing children and youth with T1DM

to check their blood glucose and administering insulin, (2) saving appropriate treats for children and youth with T1DM so they do not feel left out and (3) assisting with educating peers about T1DM.

Challenges will change over time, but appropriate ongoing interventions can assist these young people develop new management strategies as they encounter new challenges. Indeed, nurses must learn about challenges children and youth with T1DM face and develop interventions promoting health and minimizing complications.

CONCLUSION

Insulin non-adherence is common even in patients treated in specialized clinics. Education programmes, patient empowerment and specific interventions targeting newly diagnosed individuals should be implemented to improve insulin adherence among adolescents.

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