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Recurrent DKA Reduced by Home Glucose Monitoring and Clay Pot Insulin Storage in a Low Resource Setting – a case report

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BACKGROUND AND AIMS

Since 2008, MSF in collaboration with Ministry of Health of South Sudan have been running Maternal and Child Health Care in Aweil.

Among the beneficiaries, MSF is providing healthcare to a growing cohort of 130 children (average of 3 new cases per month) with type 1 diabetes mellitus which is usually complicated by diabetic ketoacidosis (DKA) at the first diagnosis, during acute illness or at monthly follow up clinic.

The majority of cohort comes from Eastern Aweil county (48.5%) and Aweil town (30.0%), with challenges that include food insecurity, inadequate community knowledge of Diabetes Mellitus, lack of insulin storage facilities, non-compliance to diabetic management measures and lack of transportation fares to regularly attend monthly follow up consultations at the hospital.

After complicated malaria (56.6%), DKA (14.1%) is the second morbidity encountered in the ICU of the pediatric ward in Aweil Hospital run by MSF.

A.C (the case report patient), a 16 year old female patient, was diagnosed to have Type 1 Diabetes Mellitus in January 2019, brought to hospital in DKA with coma, and was included in the cohort after the discharge.

With an average of 2 admissions a month for DKA and lack of improvement, despite the follow up by the diabetic clinic, the patient left Aweil to Khartoum for better management. Due to lack of means in Khartoum, her health condition deteriorated because the family was not able to pay for medications, hospitalization cost and food, so they decided to take her back to Aweil.

In February 2021, after spending 14 months in Khartoum, the patient came back to Aweil in deep coma, gasping and cachectic, she was rushed to intensive care unit and DKA management commenced immediately. The DKA resolved after 48 hours, and she was re-admitted into the cohort, but the hospitalization frequency continued to be twice a month or more for DKA, despite good follow up and management.

Identified as a priority to improve the quality of care being provided, a pilot study of home glucose monitoring was implemented, together with a more structured diabetes education.

ETHICS STATEMENT

This study is a description of an intervention and is therefore exempted from ethical review, permission to share was granted by OCP deputy Medical Director.
Before submitting this abstract the medical team got the written and signed consent from the parents of the patient.

METHOD

Six patient were selected to participate by controlling themselves at home, their blood sugar level for a period of two weeks (from 1st to 14th November 2021).
To be part of the study some inclusion criteria were defined:

- Literacy: the candidate must know how to read and write at least,
- Blood sugar level : > 300mg/dl on every follow up appointment,
- Age: >10 years old,
- Food availability: at least 3 meals a day.

During the study, the participants had to store insulin vial in a small pot put inside a bigger pot filled with charcoal and water and they had to check and record their blood glucose level every morning and evening for a period of two weeks.

One glucometer, and a strips were provided to each participant and a training was conducted to all the participants on how to disinfect, prick themselves, collect the sample on the strips, insert it in the glucometer and record the values displayed by the glucometer.

The blood sugar values were retrieved and crosschecked by the medical team by using the memory of the glucometers once returned by the participants,

AC a 16-year-old, female, weight 39 kg, Height around 1.60 m, BMI: 15.2 with type 1 DM and a history of recurrent DKA - sometimes up to 3 admissions in a month - was one of six cases selected for home glucose monitoring and clay pot insulin storage method pilot conducted in November 2021.

RESULTS

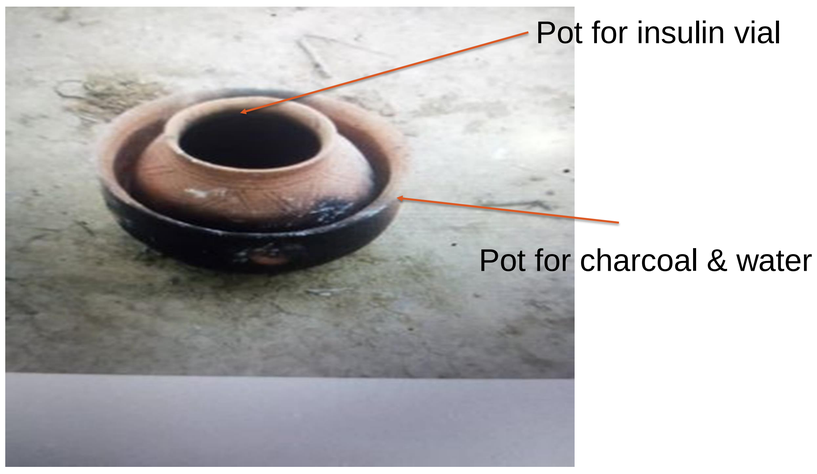
After two weeks of the study the participants returned for follow-up to the diabetic clinic with the recorded results of sugar levels.

The insulin dose was adjusted considering the BSL values recorded in the glucometers, to 1.5 IU/kg /day from 1.2 IU/kg/day for the patient AC.
For the next appointment, her average BSL dropped to 343mg/dl from 392mg/dl.

After six months following this study her DKA hospitalization reduced to one in 2 months and her last HbA1c dropped to 13.1% from more than 14% and her physical condition significantly improved.
Maternal concern of delayed menstrual cycle passed because she had menarche a couple months later, as her physical condition enhanced.

Parameters	Before BSL home monitoring	After BSL home monitoring
Weight	39 Kg	44 Kg
Average BSL during follow up	392 mg/dl	343 mg/dl
Average HbA1C	>14%	13.1%
BMI	15.2	17.2

Given the reduction in her hospitalization and general improvement of her quality of life , now she attends school with less interruptions and she wishes to become a physician to help her family and the community at large.



CONCLUSION

This case report shows clearly the importance of home glucose monitoring, the possibility of insulin storage using clay pots in a context of low resources and the place of health education in management of diabetic patients yield better outcomes.

However, the need of some literacy and adequate resources (glucometers, strips) and the management of the weekly quality control of glucometers limit home glucose monitoring.

Other factors that negatively affect the outcome of care we provide to patients are food insecurity and inadequate family support.

Due to this result, we strongly recommend to extend home glucose monitoring to other patients of the cohort.