

## Final Report (July 2019)

A partnership to tackle women and mothers with pregnancy related diabetes in Tanzania

ESTHER Switzerland Contract 2016 G7



The District Nursing Officer of Malinyi District and the Diabetes Specialist Nurse, from Lucerne Referral and Teaching Hospital (LUKS) discussing aspects of care for women with Gestational Diabetes Mellitus. Photo at Lucerne Referral and Teaching Hospital by Natalie Cabelduc, Oct 2017

## Key data of the project

Project title:	A partnership to tackle women and mothers with pregnancy-related diabetes in Tanzania, Africa
Project region, country:	Malinyi District, Morogoro Region, Tanzania
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Overall project period:	April 2017 – March 2018, no-cost extension until Dec 2018
Overall project budget:	CHF 95'705

The ESTHER Switzerland programme ( <https://www.esther-switzerland.ch> )is implemented by the Institute of Social and Preventive Medicine (ISPM) of the University of Bern, on behalf of the Swiss Agency for Development and Cooperation SDC.

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# 1. Executive Summary

## Problem and project objectives

Gestational Diabetes Mellitus is diagnosed when women without diabetes develop high blood sugar levels during pregnancy. Babies born to mothers with poorly treated Gestational Diabetes Mellitus are at increased risk of macrosomia, malformations, low blood sugar after birth, and jaundice. Gestational Diabetes Mellitus, if untreated, can also result in a stillbirth. According to the World Health Statistics 2016, 28% of the maternal mortality is due to pre-existing conditions, including diabetes. In Tanzania, very sparse data suggest that about 10% of pregnant women will show signs of Gestational Diabetes Mellitus.

In 2017, the Luzerner Kantonsspital (Lucerne Referral and Teaching Hospital, LUKS), the Lugala Lutheran Hospital (LLH) in Tanzania, and SolidarMed, with financial support from ESTHER, therefore formed a partnership to start tackling Gestational Diabetes Mellitus in rural Tanzania, through the transfer of specialized knowledge and practice from Switzerland to LLH and its staff.

The specific objects of this partnership were:

1. Capacity building and experience exchange: Training of nurses on pathophysiology of Gestational Diabetes Mellitus, prevention and treatment with dietary measures, pharmacological treatment with insulin (treatment goals, and follow-up) through the Lucerne Referral and Teaching Hospital at the Lugala Lutheran Hospital, and through a visit at Lucerne Referral and Teaching Hospital by the trained nurses from Lugala Lutheran Hospital
2. Introduction and implementation of a routine screening for Gestational Diabetes Mellitus in pregnant women at the Lugala Lutheran Hospital with the guidance of Lucerne Referral and Teaching Hospital
3. Introduction of a standard long-term algorithm for diagnosing and treatment including counselling-based on the above results
4. Establishing a longer-term mutually balanced partnership for knowledge exchange and specific support

## Project progress

The project implementation commenced in April 2017 and ended, after being granted a no-cost extension, in December 2018. The project managed to establish a partnership with a long-time perspective between the three institutions, Lucerne Referral and Teaching Hospital, Lugala Lutheran Hospital, and SolidarMed, and with lasting positive professional and intercultural implications. It also increased local and international knowledge about women in reproductive age with Gestational Diabetes Mellitus in rural Tanzania as well as about possibilities to address and manage this potentially threatening condition. This knowledge may now inform policies at local, district and regional level and can be shared nationally and internationally. The project further improved service delivery and ability to diagnose and manage pregnant women with Gestational Diabetes Mellitus and other diabetes patients (spill-over effect) at Lugala Lutheran Hospital and the whole district of Malinyi through various training, exchange visits and awareness raising activities.

Finally, the project answered the following lead questions.

1. What is the prevalence of Gestational Diabetes Mellitus and its outcomes?
2. How can the standardized diagnosis and management of a chronic disease in women of reproductive age be introduced at a rural district hospital without negative effect on other services?
3. Can the lessons learnt from the implementation of the project at Lugala, based on the North-South partnership, allow recommendation of up-scaling within and beyond Tanzania?

A **prevalence of 12.8%** was found in the cohort of rural and normal weight pregnant women (Answer to lead question 1). This was very much in-line with the estimated 10% prevalence that was presumed in advance for Tanzania (cf. below, section 2). However, given the rural area this is a surprisingly high number. Also, possibilities to address and manage this potentially threatening condition were tested and discussed.

Given the fact, that almost all diagnosis of Gestational Diabetes Mellitus were made by the fasting glucose value, the participants of a policy dialogue symposium concluded that at the current situation in rural areas, Gestational Diabetes Mellitus measurements could be reduced to a **one-off routine glucose measurement** using capillary blood between the 24th and the 28th week of gestation with similar diagnostic accuracy but much less expenditure. In case this value

would then be above the normal range, patients should be advised to go for further investigation and a proper Diabetes Mellitus and Gestational Diabetes Mellitus diagnosis (Answer to lead question 2).

This is also the **recommendation** for other rural African settings where prevalence is suspected to be around the same as in our study cohort. However, this requires that the health authorities (a) have a rough idea of the Gestational Diabetes Mellitus prevalence in their setting and (b) keep track of changing prevalence and switch to another procedure in case prevalence increases (Answer to lead question 3). In addition, ownership and identification of focal persons in the health facility, who benefitted from specific trainings on this topic, as well as supervision of clinical practice and commitment by regional health authorities are needed to ensure a sustainable impact .

## **Outlook**

All contracting partners were engaged to create a sound base for a mid-term/long-term partnership. Partners learned to know each other in every partner's home setting and planned and implemented activities jointly. Lugala Lutheran Hospital has a good perspective for further improving its services and ensuring quality of diagnosis, therapy and patient care, if backed up by the initiated North-South hospital partnership. On the other hand, Lugala Lutheran Hospital's potential for learning of health personnel from Switzerland was recognized well by colleagues from Lucerne Referral and Teaching Hospital. The partnership has the potential to grow further, include more technical areas and catalyse further exchange of skills and knowledge. Future cooperation depends on interest, commitment and good will from both sides as well as funding in order to fully use the potential for exchange, mutual learning, generation of new evidence, and finally improvement of health care both in the South and North.

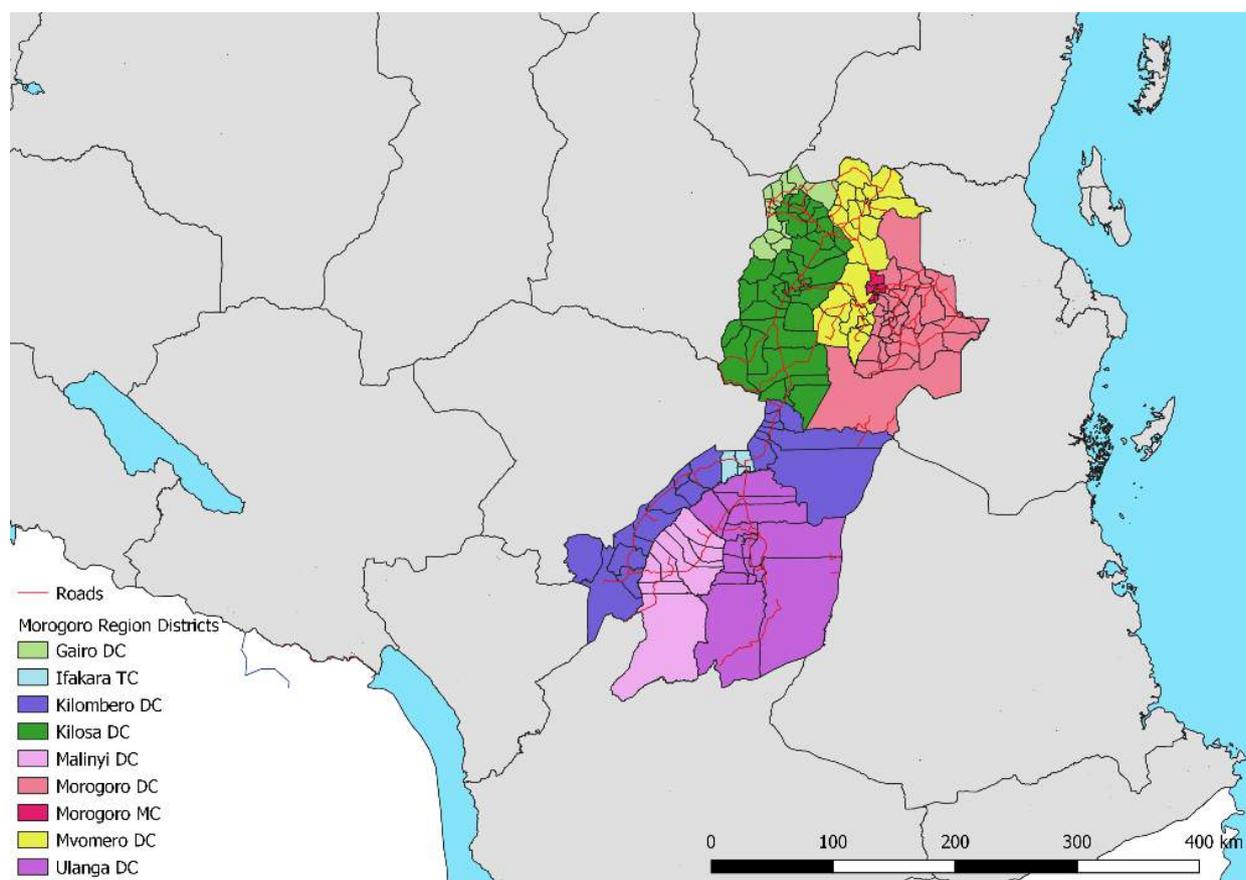
## 2. Context

Gestational diabetes mellitus (GDM) is diagnosed when women without diabetes develop high blood sugar levels during pregnancy. Babies born to mothers with poorly treated GDM are at increased risk of macrosomia, malformations, overweight, low blood sugar after birth, and jaundice. Their probability of developing type 2 diabetes later in life is higher. GDM considerably increases the risk of perinatal outcomes such as eclampsia, neonatal hypoglycaemia, and respiratory distress syndrome; and, if untreated, it can result in a stillbirth. According to the World Health Statistics 2016, 28% of the Maternal Mortality is due to pre-existing conditions, including diabetes.

Epidemiological data about GDM in African countries are sparse, but the prevalence is estimated to reach up to 13.9% of pregnant women, with an estimated 10% in Tanzania. The need of promotion and implementation of GDM guidelines in low resource settings is therefore stressed. GDM also increases the need for caesarean sections, which is often still unreachable for many women in rural districts of Tanzania.

The health situation in Tanzania is characterized by a triple disease burden of (i) infectious diseases, (ii) an increasing number of patients with non-communicable diseases (NCD) and (iii) a high burden of maternal and sexual health challenges. Tanzania aims at achieving universal access to quality sexual and reproductive maternal and adolescent services. With regard to NCDs, the focus is on prevention, screening and early treatment. The Tanzanian National Diabetes Programme aims at ensuring diabetes screening and basic treatment by all council hospitals by 2020.

The health system of the remote Malinyi district, which is located in the South of Morogoro region, consists of 13 dispensaries (health posts), 1 health centre and 1 hospital. The overall health situation is characterized by the triple burden of diseases, the on-going efforts to control the wide spectrum of well-established diseases effectively and the un-preparedness of the system to the massive advent of NCDs. The district health system is managed and supervised by the District Medical Officer and the Council Health Management Team. Limited access to health services (geographically, technically and financially) and lack of human resources for health are the main challenges.



Map of Morogoro region in the South of Tanzania. All its nine councils (District, Town or Municipal Councils (DC, TC or MC)) are shown

The Lugala Lutheran Hospital (LLH) is located in Malinyi district and is a first referral level hospital within the Tanzanian District Health System. It is a non-governmental, faith-based institution with 154 beds and covers a population of 164'000 people. It is the reference hospital in the district and offers a range of medical and operative services (including communicable and NCDs), which exceed the common service level of Tanzanian district hospitals. It also offers diabetes screening and basic treatment (insulin, oral antidiabetics). However, it does not provide GDM screening services routinely. LLH in-patient data from 2017 showed a morbidity profile, whereby 66% were communicable, maternal, perinatal and nutritional conditions, 10% were injuries and the remaining 24% were NCDs. Diabetes made up 1% of the diagnoses (however, these were diagnosis of type 2, which is clearly different from the GDM which has to be diagnosed by with an oral Glucose Tolerance Test during 24<sup>th</sup> to 28<sup>th</sup> week of gestation).

The Luzerner Kantonsspital (LUKS) is the tertiary hospital centre of central Switzerland encompassing a population of about 800'000 people. There are 800 hospital beds and all the medical specialties are offered. The division of endocrinology and diabetology has one of the largest outpatient clinics in Switzerland and oversees additional clinics in various peripheral hospitals (Sursee, Wolhusen, Schwyz, Stans, and Sarnen). The category for training house officers is labelled A (according University Hospital status).

SolidarMed is the Swiss Organization for Health in Africa. Closely linked to a variety of medical actors in Switzerland, SolidarMed collaborates with hospitals, research institutions and Governments in 5 Sub-Saharan countries: Zimbabwe, Tanzania, Mozambique, Lesotho and Zambia. The strategic focus of the SolidarMed programs lies with sexual and reproductive health including HIV/AIDS, primary healthcare, the health of children, selected infectious diseases and NCDs.

The LUKS, LLH in Tanzania and SolidarMed formed a trilateral partnership to start tackling GDM in Tanzania through the transfer of specialised knowledge and practice from Switzerland to LLH and its staff. Therefore, the project "A partnership to tackle women and mothers with pregnancy-related diabetes in Tanzania, Africa" was developed. The long-term goal of this project was to foster a partnership to regularly exchange knowledge and experience.

Pregnant women with GDM and their new-borns are the primary beneficiaries of this project. All women in reproductive age in the district are secondary beneficiaries through more comprehensive sexual and reproductive health services. All health personnel (North and South; clinical and non-clinical staff) are tertiary beneficiaries through the additional experiences, and knowledge exchange.

## 3. Progress and Results

### 3.1. Overall Goal: Impact of the project

<b>Goal:</b>	To improve sexual and reproductive health of women at LLH catchment area in rural Tanzania through technical advice, capacity building, experience exchange and the introduction of screening pregnant women for GDM together with a standard algorithm for treatment – thus contributing to reduce morbidity and mortality for women and their new-borns.
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The impact of the project was expected to be as follows:

- 1) Establishment of a partnership with a long-time perspective between the three institutions, LUKS, LLH, and SolidarMed, with lasting positive professional and intercultural implications
- 2) Increment of local and international knowledge about women in reproductive age with GDM in rural Tanzania as well as about possibilities to address and manage this potentially threatening condition. This knowledge should inform policy at local, regional or national level and can be shared internationally.
- 3) Improvement of service delivery and ability to diagnose and manage pregnant women with GDM, as well as increase the potential of LLH to manage other related patients (spill-over effect).

#### **Achievements:**

In regard to the first point, chances for knowledge and practice gain/exchange/sharing in an international context were taken up, used and optimized on side of both partners. All contracting partners were engaged to create a sound base for a mid-term/long-term partnership. Partners learned to know each other as well as their approach and interventions in their respective setting. They also planned and implemented activities jointly. LLH has a good perspective for further improving its services and ensuring quality of diagnosis, therapy and patient care, if backed up in the initiated hospital partnership. On the other hand, LLH's potential for learning of health personnel from Switzerland was recognized well by colleagues from LUKS. Future options for cooperation depend on interest, commitment and good will from both sides in addition to funding to strengthen and expand the established partnership beyond the thematic focus and project duration.

In respect to the second point, knowledge about women in reproductive age with GDM in rural Tanzania could be increased. A prevalence of 12.8% was found in our cohort of rural and normal weight pregnant women. This was very much in-line with the estimated 10% prevalence that was presumed in advance for Tanzania (cf. above section 2). Also, possibilities to address and manage this potentially threatening condition were tested and discussed. The participants of the policy dialogue symposium concluded that at the current situation in rural areas, GDM measurements could be reduced to a one-off routine glucose measurement using capillary blood between the 24th and the 28th week of gestation with similar diagnostic accuracy but less expenditure. In case this value would then be above the normal range, patients should be advised to go for further investigation and a proper DM and GDM diagnosis. This is the recommendation for rural African settings where prevalence is suspected to be around the same as in our study cohort. However, this requires that the health authorities (a) have a rough idea of the GDM prevalence in their setting and (b) keep track of changing prevalence and switch to another procedure in case prevalence increases.

The discussion and dialogue with decision makers and managers at district and regional level thus started during the project period. However, to have a wider impact, more time is needed. Moving forward, SolidarMed will try to establish the routine screening as recommended at LLH. The routine screening will be monitored to create sufficient evidence of this approach. If the approach proves to be effective, SolidarMed will put efforts in sharing the lessons learnt to a wider public in Tanzania and start a policy dialogue at higher level.

Finally, regarding the last point of the expected impact, the project clearly contributed to improvements in service delivery and ability to diagnose and manage pregnant women with GDM and other patients (spill-over effect) at LLH and the whole district of Malinyi through various training, exchange visits and awareness raising activities. Given the decision that the applied screening method was not the most appropriate and cost-effective in our setting the project activities could be extended to all types of DM (GDM, type 1 and 2) and to the community. This even led to higher impact than expected as more common health issues (type 2 DM) and a broader target group could be included, which benefitted from project interventions and improved service provision.

### 3.2. Outcome and Outputs: Achievements

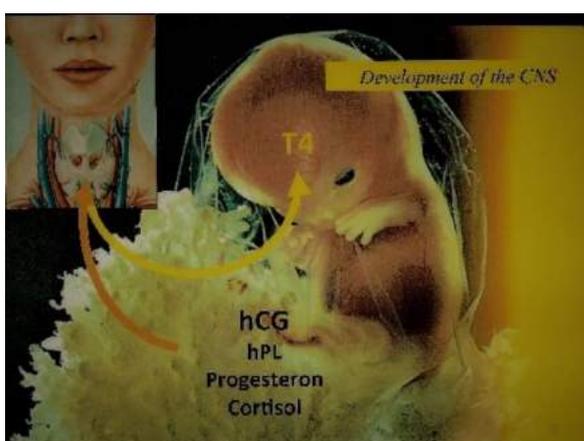
Objective 1:	Capacity building and experience exchange: Training of nurses on pathophysiology of GDM, prevention and treatment with dietary measures, pharmacological treatment with insulin (treatment goals, and follow-up) through LUKS at LLH, and through a visit at LUKS by the trained nurses from LLH	✓
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#### Progress and achievements:

##### 1) Assessment and elaboration mission (North – South)

The project started with a planning and preparation phase at LLH. In July 2017, the Lugala visit of Prof Dr Ch Henzen, Head of Department of Internal Medicine and Chief Medical Officer of the Section of Endocrinology and Diabetology at LUKS and recipient of the ESTHER grant, together with a Diabetic Specialist Nurse, initiated the implementation phase of the project. This was also the first physical contact between the two partner hospitals. At Lugala the guests from Lucerne encountered a health system with extremely limited material, logistic, financial resources and poor hospital clientele, but great hospitality of people who try to find adequate adaptations to often tough circumstances. The visit of the two experts from Switzerland included:

- First hand and on-site information about LLH and the strengths, weaknesses, opportunities and challenges of its environment in terms of medical, social-anthropological and socio-economic patterns
- Introduction and preparation of the prospected half year GDM screening phase at the Reproductive and Child Health (RCH) clinic of LLH. This included aspects of:
  - o diagnosis of GDM in a pragmatic and practical way
  - o local infrastructure and logistics
  - o capacity of LLH laboratory
  - o integration of the GDM screening in usual RCH routine
  - o set up of therapy algorithm (from nutritional counselling to intensive insulin therapy)
  - o exchange of LUKS representatives and health workers identified by LLH to conduct the screening
  - o time line for screening phase
- Teaching sessions on the following topics:
  - o Instruction of blood sugar assessment; nutritional counselling as duty of nurses; insulin therapy as duty of doctors
  - o GDM and DM in general for health staff
- Outline of prospected LUKS-visit of Lugala clinicians /nurses who were supposed to conduct the screening and perform afterwards as Diabetes Specialist Nurses at Lugala



(1)

(1) One slide out of a striking and illuminating teaching session regarding DM and GDM held at Lugala for clinical and nursing staff of LLH and members of the Council Health Management Team, the steering body for health in Malinyi District

## 2) Capacity building mission (South – North) I

In October 2017, six clinicians and nurses from Lugala spent 2 weeks at LUKS in Lucerne for capacity building on DM and GDM in order to work as diabetes specialists at LLH upon their return. At LUKS the guests from Lugala encountered a maximum technical setting, flat hierarchy, mutual respect among people irrespectively of their position and high commitment and empathy in care for patients. The visit gave room for various discussions and opened plenty of knowledge sharing opportunities. Training contents at LUKS were:

- Diabetes mellitus (DM)– Background, physiology/pathophysiology, prevention and treatment with dietary measures, oral antidiabetics and insulin
- Type 1 DM
- Type 2 DM
- GDM in Europe and in Africa
- Introduction and implementation of routine screening for GDM
- Oral Glucose Tolerance Test (oGTT)
- Introduction of standard algorithms for GDM diagnosis and treatment
- Counselling DM and GDM patients
- Nutrition in DM cases
- Medical treatment of GDM
- The Diabetes Specialist Nurse (Counselling, Blood glucose self-assessment & self-reporting, treatment targets)

Further, there was an extensive exchange about the Lugala – LUKS project itself and Tanzanian clinician and nurses learnt about living and working in an international and intercultural context. This facilitated a mutual balanced partnership for knowledge exchange and support between the two hospitals. After their return to Lugala, participants were conducting the GDM screening over the prospected time period of six months (Nov 2017 - Apr 2018) and, since, are involved in diagnosis, counselling, therapy and monitoring of diabetes patients.



Left: Prof Dr Christoph Henzen, LUKS, and Assistant Medical Officer Lusekelo Mponi, Lugala, during consultation with a diabetes patient at LUKS; Right: Participants of the capacity building mission on the top of the LUKS; Both photos by LUKS, Oct 2017

## 3) 7-day training workshop on nutrition and life style

Given the decision to extend the screening to all types of DM (GDM, type 1 and 2) and to the community (see objective 2, activity 2) a 7-day training workshop on nutrition and life style was organized in Malinyi in December 2018. The training was implemented by the Centre for Counselling, Nutrition and Health Care (COUNSENUH), Tanzania, and in close cooperation with District Health Authorities of Malinyi and LLH making use of the lessons learnt from the exchange with LUKS. COUNSENUH is a well-established Tanzanian NGO that is, among others, consultant to Ministry of Health. It is specialized for nutrition and life style issues, and generally focuses on health promotion. The COUNSENUH team consisted of PhD holders in human nutrition and a medical doctor from Amana Regional Hospital in Dar es Salaam. Teaching language was solely Swahili to increase understanding and participation. It was impressive to see that the COUNSENUH team understood it well to show that even poor people whose diet, until now, consists of 90% or more carbohydrates, can do a lot to enrich their food with locally grown vegetables. The workshop was very

participative and based on real-life situation. Presented slides were read by volunteering participants from the auditory and food, which was used for teaching, was all bought from the local market.

The 7-day training workshop on health promoting nutrition and life style topics was split into the following sessions:

- 4-day workshop for health professionals, like doctors, clinical officers, nurses, etc. from the LLH, Lugala School of Nursing, the District Health Authorities and all 15 health facilities of Malinyi District (total 38 participants)
- 1-day facilitator training for 19 participants of the preceding 4-day workshop, who were chosen to be trained further to becoming 'Trainer of Trainers (ToTs)'
- 2-day workshop on awareness creation about health promoting nutrition and life style for all 42 Community Health Workers of Malinyi District, 28 Trainers of Community and 12 diabetes patients from villages. This was done by the 19 newly trained ToTs under supervision of the COUNSENUTh team.

All participants gained a different understanding about life style, physical activity and nutrition that can be called a 'paradigm shift'. In the future it is expected that the ToTs will act as facilitators for the dissemination of messages about health promoting nutrition and life style in the community. The Community Health Workers and the Trainers of Communities will continue disseminating the contents they learned among community members and families.



(1) Very animated and shared sessions during the 'COUNSENUTh week'

(2) Maria has participated as one of diabetes patients who came from distant villages

(3) COUNSENUTh instructor explaining about the food bought at the local market

(4) All food, vegetables, fruits, spices used were, together with workshop participants, bought at the local markets in Lugala and Malinyi

<b>Objective 2:</b>	Introduction and implementation of a routine screening for GDM in pregnant women at the LLH with the guidance of LUKS	↻
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**Progress and achievements:**

**1) Screening and patient management**

Epidemiological data on GDM are sparse in Tanzania, and virtually absent concerning the new diagnostic criteria based on the 75g oral glucose tolerance test (oGTT). The study aimed to assess the prevalence of GDM in a rural hospital in Tanzania, as well as the implementation of diagnostic and therapeutic measures based on the partnership of LLH, LUKS and SolidarMed. Additionally, this would also answer lead questions 1 of the project documented here: **“What is the prevalence of GDM and its outcomes?”**

The prospective cohort study took place between 1st November 2017 and 30th April 2018 at LLH’s RCH clinic. The study included pregnant women between the 16<sup>th</sup> and 32<sup>nd</sup> week of pregnancy attending the LLH. The study participants were screened for GDM using the 75g oGTT. Therefore, the fasting glucose was measured at time point 0 by taking venous blood. Afterwards the pregnant women were given 75g glucose in local beer bottles, cleaned and sterilized at hospital’s infusion unit. Glucose levels were again measured after 1h and 2h.



Conduction of oGTT at LLH’s RCH clinic. From left to right: Serapia Tarimo, Diabetes Specialist Nurse; three pregnant women, having given their informed consent for testing; Emanuel Mdetta, Laboratory Assistant; Abel Kilunda, Clinical Officer; Serapia and Abel have been trained at LUKS

A total of 301 women participated at the study. However, 12 had to be dropped because (a) they left before the last measurement (6), (b) the glucometer was defect (3), (c) they vomited after ingestion of oGTT (2) or (d) the gestational age was outside the defined age range. Thus, data of 289 women were analysed. The mean gestational age was 24.0 weeks, the mean age 25.6 years, the mean gravida 3.4/para 2.3, and the mean Body Mass Index (BMI) 25.1.

Depending on the criteria used for diagnosis of GDM 0 – 12.8% of women were diagnosed with GDM. Table 1 summarizes the criteria for diagnosis of GDM. Table 2 shows how many women had plasma glucose levels according to the criteria and time point of measurement as well as how many were diagnosed with GDM.

**Table 1.** Criteria for diagnosis of GDM

Guideline	Fasting plasma glucose	1h plasma glucose I	2h plasma glucose
WHO, 1999*	≥7.0 mmol/l	Not required	≥7.8 mmol/l
Canadian Diabetes Association (CDA)**	≥5.3 mmol/l	≥10.6 mmol/l	≥8.9 mmol/l
<b>IADPSG<sup>1</sup></b>	<b>≥5.1 mmol/l</b>	<b>≥10.0 mmol/l</b>	<b>≥8.5 mmol/l</b>
DIPSI <sup>2</sup>	Not required	Not required	≥7.8 mmol/l
American Diabetes Association (ADA)**	≥5.3 mmol/l	≥10.0 mmol/l	≥8.6 mmol/l

<sup>1</sup> International Association of Diabetes and Pregnancy Study Group: these recommendations were used in our work.

<sup>2</sup> Diabetes in Pregnancy Study Group of India

\*One value sufficient for diagnosis

\*\*Two or more values required for diagnosis

**Table 2.** Number of women who had plasma glucose levels according to the criteria and time point of measurement based on the criteria provided in Table 1.

Guideline	Fasting plasma glucose	1h plasma glucose I	2h plasma glucose	Number of GDM positive women (%)
WHO, 1999	0	NA	1	1 (0.3%)
CDA	26	0	0	0 (0%)
IADPSG	37	0	0	37 (12.8%)
DIPSI	0	NA	1	1 (0.3%)
ADA	26	0	0	0 (0%)

When using the most conservative criteria (IADPSG), 37 women had pathological fasting glucose and none of them had abnormal 1h and 2h plasma glucose values. The plasma glucose levels of all 37 were significantly higher than in women with normal fasting glucose levels according to IADPSG criteria.

In addition to the blood glucose levels, data on 100 births were available: the mean birth weight in the GDM group based on IADPSG criteria was  $3.32 \pm 0.6$  vs.  $3.27 \pm 0.5$  in women with normal oGTT ( $p=0.38$ ). The APGAR<sup>3</sup> score in both groups according to IADPSG criteria was also similar.

In conclusion, given that:

- a. the screening included women before and after the for screening recommended weeks of gestation (24<sup>th</sup> to 28<sup>th</sup> week)
- b. some women might not have been fully fasting at the first point when fasting plasma glucose was measured
- c. there was no difference in the outcome of the pregnancy as far as birth weight, early neonatal mortality and APGAR score are considered

we decided that the 75g oGTT interpreted according to the IADPSG criteria might not be the most appropriate criteria in our setting (also because according to other criteria shown in Table 2, **the prevalence of GDM in our cohort of rural and normal weight pregnant women was rather low**) (cf. Answer to lead question 1). Therefore, under such conditions, routine GDM measurements in the way as they were done for this study appear for the time being not cost-effective.

Apart from the GDM related results, it was also surprising that only around one third of all women who went to LLH for antenatal care delivered at LLH. This could have two reasons:

- a. The numbers are wrong, because it is difficult to match the RCH register entries with the maternity register entries and thus the number of deliveries at LLH out of all is so low.
- b. Women attend the RCH in Lugala, which is free, but do not deliver at LLH due to the cost of TSh 80'000/75'000 (35/33USD). Where they delivered remains a question. It could be (1) at public health facilities, where deliveries are free, or (2) at home.

## 2) Data management support

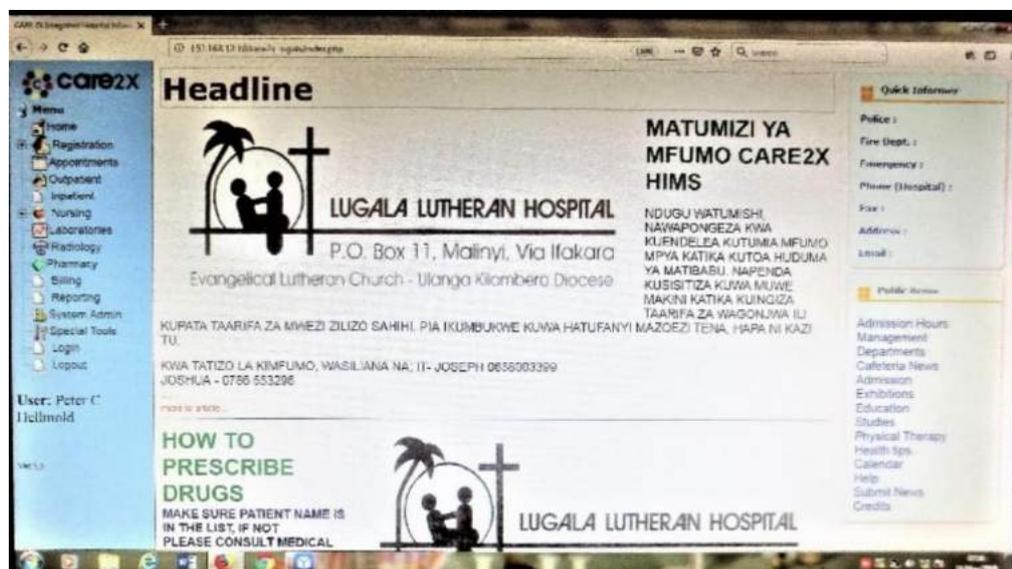
Given the challenges seen in proper data management during the study documented above, the project decided to take measures to improve the situation.

- a. Contributing to the establishment of an electronic general patient administration tool at LLH

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<sup>3</sup> APGAR is a quick test performed on a baby at 1 and 5 minutes after birth. The 1-minute score determines how well the baby tolerated the birthing process. The 5-minute score tells the health care provider how well the baby is doing outside the mother's womb

The management of an increasing number of chronic patients who are taking lifelong treatment was a discussion topic between LLH and LUKS as the challenges are similar. The project thus contributed to the establishment of electronic general patient administration and store keeping system at LLH for strengthening the hospital's administrative capacity, financial transparency and accountability. In the context of the project reported on here this system will substantially improve administration of DM, GDM and NCD patients, from registration over establishment of diagnosis and therapy (particularly aiming at uninterrupted drug supply) up to patient's follow up.



Part of the front page of the new administration tool, called 'CARE2X webERP'

- b. Supporting the participation of health staff in a short course on “Data Management and Analysis in the Health Sector”

In November 2018, the project supported a data training on “Data Management and Analysis in the Health Sector” for 15 health staff dealing with data at hospital and district level. The training was arranged by Mzumbe University Morogoro in cooperation with the Ministry of Health and University of California. It turned out that even basic termini as mean, median, histogram, bar chart, pie chart etc were not known to the participants. However, participants were highly committed and gave very positive feedbacks about the training contents. They asked SolidarMed for a repetition of such training at district level for 2019, which will be done within the frame of another SolidarMed project in this district. The training clearly contributed to better data management in the future, including data related to DM and GDM.

### 3) Community data collection during public health activity

According to the above decision the screening was extended to all types of DM (GDM, type 1 and 2) and to the community. In August 2018, together with the district health services a one-week public health activity in the form of diabetes community screening was conducted in Ngoheranga division. This included an assessment of general ‘NCD parameters’ like BMI and blood pressure measurement. It was also supplemented by ophthalmological/HIV/Tuberculosis screening in order to get an idea about comorbidities.

Pathological results	Female (n=620)	Male (n=357)	Total (n=977)
Diabetes mellitus	13 (2.1%)	15 (4.2%)	28 (2.9%)
Blood pressure	44 (7.1%)	24 (6.7%)	68 (7.0%)
BMI < 18 (underweight)	7 (1.1%)	4 (1.1%)	11 (1.1%)
BMI 25 – 29 (pre-obese)	52 (8.4%)	41 (11.5%)	93 (9.5%)
BMI >30 (obese)	20 (3.2%)	7 (2.0%)	27 (2.8%)

DM was found in 28 cases (2.9%). Two out of the 28 were on treatment and the rest were newly detected out of which all were likely to have type 2 DM. The prevalence found for DM was still at low level, but in the range of what was expected for such an area. However, given that Ngoheranga is a very poor area, it is remarkable that 12.3% of adults screened were pre-obese or obese and 7% had high blood pressure. As stated above, this was a public health activity and it was not a screening with a statistically sound design. This might have caused biases. Nevertheless, it still gives a slight idea about the epidemiology of a poor rural Tanzanian district and it raises ideas for conduction of operational research.

Objective 3:	Introduction of a standard long-term algorithm for diagnosing and treatment including counselling-based on the above results	↗
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### Progress and achievements:

#### 1) GDM symposium in Ifakara (South – South)

Based on the results presented under objective 2 and the fact that the diagnosis of GDM in our cohort was almost exclusively based on the fasting plasma glucose, we tried to find other ways **how standardized diagnosis and management of a chronic disease in women of reproductive age can be introduced at a rural district hospital without negative effect on other services** (Lead question 2 of the project reported here).

Therefore, SolidarMed organized in December 2018 a GDM symposium in Ifakara with Dr Akwilina Wendelin Mwanri (PhD) from the Department of Food Technology, Nutrition and Consumer Sciences at Sokoine University of Agriculture in Morogoro. She did her PhD in Human Nutrition at the University of Wageningen in the Netherlands in 2015. Her thesis was the first study that assessed the burden of GDM and its determinants in Tanzania. Elder studies were few and diagnostic criteria poorly defined. Epidemiology, risk factors and life-style were among the main aspects of a very energetic and in-depth presentation followed by a wide-ranging discussion.

Amongst others, the participants were:

- the District Commissioner (DC) of Kilombero District who worked - before having been assigned as DC - for 23 years at Ministry of Health and thus paid much interest for this medical topic
- the Regional Medical Officer as the overall in charge of health in Morogoro Region
- All District Medical Officers of Kilombero, Ulanga, Malinyi districts and Ifakara town as the overall in charges of health in their respective areas
- All NCD coordinators of Kilombero, Ulanga, Malinyi districts and Ifakara town
- All Medical Officers in charge of hospitals in Kilombero, Ulanga, Malinyi districts and Ifakara town
- Members of LLH's clinicians and nurses who visited LUKS in October 2017



The Regional Medical Officer during his opening speech (in the centre); on the left the District Commissioner and on the right the Town Medical Officer of Ifakara.

With Dr Mwanri as presenter we had one of the foremost scientists and researchers on nutrition and life style issues in East Africa. All participants highly appreciated the topic of the symposium. The participants of the symposium concluded that **at the current situation in rural areas, GDM measurements could be reduced to a one-off routine**

glucose measurement<sup>4</sup> using capillary blood between the 24<sup>th</sup> and the 28<sup>th</sup> week of gestation with similar diagnostic accuracy but less expensive. In case this value would then be above the normal range, patients should be advised to go for further investigation and a proper DM and GDM diagnosis (Answer to lead question 2). Thus, the symposium had a clear impact on informing policy. LLH as the only hospital in the district of Malinyi and the project site, may now, together with the District Authorities, have a leading role in the uptake of these recommendations and contribute to the policy dialogue. This is an achievement of this project.

## 2) Supply of equipment and laboratory reagents

To adequately care for diabetic patients even in the periphery of the district, all 13 dispensaries, the only health centre and LLH were supplied with corresponding equipment, so that all health facilities are now able to measure blood sugar levels and monitor diabetes patients. The following was distributed:

- Weighing scales, measure tapes and charts for assessing BMI
- Sphygmomanometers and stethoscopes for assessing blood pressure
- Glucometers, spirit, swabs, lancets, test strips for assessing blood sugar level
- Disposable gloves
- Safety boxes for discarding sharp potentially infected materials (e.g. used lancets)

Additionally, diabetes patients have huge issues with wounds and abscesses, which not seldom lead to amputation or even repeated amputations. Thus, they are much more susceptible to such kind of complications than the average patient. However, surgical kits, which would be needed to treat such cases, were not or only in insufficient quantity and quality available in the project area. Therefore, to adequately care for diabetic wounds and ulcers all 15 health facilities were provided with surgical kit for minor surgery. Minor surgery can avoid wounds to deteriorate and thus avoid amputations. Each kit contained:

- 1 kidney dish
- 1 gallipot
- 1 mucus extractor catheter
- 2 forceps KOCHER
- 2 forceps PEAN
- 1 dissecting forceps toothed
- 1 dissecting forceps untoothed
- 1 sponge holding forceps
- 1 needle holder
- 3 scissors (cutting, episiotomy, umbilical)

Finally, as part of the partnership between LUKS and the LLH, which was funded and facilitated through ESTHER, a haematology analyser was donated by LUKS to the LLH. The project purchased reagents for the haematology analyser from a local supplier to ensure that the machine, which was brought to LLH through the LUKS/LLH partnership, could be used adequately. . This machine and its reagents are important for the clinical monitoring of diabetes patients, because they are at risk for acquisition of infectious diseases. Moreover, the presence of an infection in a diabetes patient makes it more difficult to keep blood glucose within the physiological range and to control glucose metabolism. Thus, patient management and clinical outcome is improved.

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<sup>4</sup> If possible fasting, otherwise random glucose level

## Progress and achievements:

## 1) Capacity building mission (South – North) II

In November 2018, Dr. Emanuel Chogo, the new Medical Officer in charge of the LLH, went to Lucerne for another exchange visit South – North. Emanuel Chogo is a Tanzanian medical doctor and the successor of the European SolidarMed medical doctor, Dr. Peter Hellmold, who was in charge of the LLH from May 2009 until April 2018. During his visit at LUKS, Lucerne, Dr Emanuel Chogo managed to achieve the following:

- Gain theoretical knowledge and practical management (capacity building) in respect to DM and GDM aiming at strengthening quality service delivery at the LLH
- Exchange knowledge and experience regarding DM and GDM in an international context with the aim of transferring the knowledge back to LLH and capacitate local health staff
- Strengthening and sustaining the initiated partnership between LUKS and the LLH and therefor contribute to the long-term sustainability of the project (see newspaper article below)
- Reinforcing the knowledge transfer from the predecessor, Dr. Peter Hellmold, to Dr. Emmanuel Chogo in terms of knowledge and skills in regard to DM and GDM
- Visit of SolidarMed headquarter to strengthen the partnership to LLH

Donnerstag, 15. November 2018

Zentralschweiz 27

Lozärer Usdröck  
*Hudigääggeler*

Die Schweizer Volksmusik ist auch über die Landesgrenzen hinaus beliebt. Aber nicht alle mögen sie. Und wer sie nicht mag, kann dies mit einem idiosyncratischen Wort zum Ausdruck bringen: «Hudigääggeler». Der Begriff bezeichnet (nicht nur) in Luzern schlecht gespielte Länder. Der Ursprung des Wortes reicht ins 19. Jahrhundert zurück. In Einsiedeln spielten damals mehrere Ländlerkapellen um Johann Fuchs. Ihr Stil, der die Innerschweizer Volksmusik nachhaltig prägen würde, war überaus erfolgreich. Im Volksmund wurde er «Hudeli-Musik» genannt.

«Hudeli» war der Übername der Fuchs-Familie. Denn Fuchs' Ungrossmutter soll ihre Hühner und Enten mit dem Ausruf «Chum Hudeli, Hudeli chum, chum!» in den Stall gelockt haben. Das berichtet Pius Ruhstaller im Buch «Volksmusik Einsiedeln – Alpthal – Ybrig». Der Zusatz «Gääggeler» dürfte vom Verb «gäggeln» oder «gäggeln» abgeleitet sein, das laut Mundart-Wörterbuch Idiotikon so viel wie unvollständig, unvollständig

## Sie bekämpfen Diabetes in Afrika

**Luzern** Die sogenannte Wohlstandserkrankung Diabetes Typ 2 macht auch vor Afrika keinen Halt. Das Wissen über die Krankheit ist dort aber begrenzt. Der Luzerner Arzt Christoph Henzen setzt genau da den Hebel an.

Yasmin Kunz  
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Knapp 7000 Kilometer liegen zwischen Luzern und Lugala. Trotzdem stehen die Spitäler – das Luzerner Kantonsspital (LUKS) und das Spital Lugala im südlichen Tansania – in einem engen Austausch. Das LUKS und das Partnerspital von SolidarMed in Lugala haben im Frühling 2017 gemeinsam eine Partnerschaft gegründet mit der Unterstützung von «Esther Schweizerland».

Die Krankheiten in Lugala unterscheiden sich grundsätzlich von jenen in Luzern. In Lugala suchen Patienten in der Regel das Spital auf, wenn sie an Malaria oder Durchfall erkrankt sind. Eine Gemeinsamkeit haben sie dennoch: Die chronische Krankheit Diabetes Typ 2 (siehe Kasten).

### Mit wenig Mitteln vielerreichen

Christoph Henzen (58), Departementsleiter Medizin und Chefarzt Endokrinologie-Diabetologie am Luzerner Kantonsspital, war im August für zwei Wochen in Lugala. Dabei hat er sein Wissen als Spezialist für Schwangerschaftsdiabetes weitervermittelt. «Das Ziel war insbesondere, Diabetes auf die medizinische Landkarte zu heben. Und bei der



Arzt Emmanuel Chogo (links) profitiert vom Diabetes-Fachwissen von Chefarzt Christoph Henzen. Bild: Dominik Wunderli (Luzern, 13. November 2018)

Article in the newspaper of Lucerne ('Luzerner Zeitung') from 15 November 2018, about the visit of the Medical Officer in charge of LLH, Dr. Emmanuel Chogo, MD, at Lucerne Referral & Teaching Hospital ('Luzerner Kantonsspital', LUKS). Title: 'They fight against diabetes in Africa' ('They' = Prof. Dr. med. Christoph Henzen, Head of Department of Internal Medicine and Chief Medical Officer of Section of Endocrinology and Diabetology at LUKS, and Emmanuel Chogo, MD, from Lugala, Tanzania). Full version of the article in the annex

To be specific Dr. Emanuel Chogo had the unique chance to get first-hand information about the following topics from Prof Dr Christoph Henzen:

- Pathophysiology of DM and GDM
- Prevention and treatment of the disease with dietary measures
- Pharmacological treatment with insulin (treatment goals and follow-up)
- Routine screening of DM and GDM during ward rounds at LUKS and through discussions
- The standard long-term algorithm for diagnosis and treatment of GDM inclusive counselling

Additionally, Dr. Emanuel Chogo had the exclusive opportunity to attend the annual meeting of the Swiss Society for Endocrinology and Diabetology. There, he was able to again get a more in-depth knowledge and understanding about DM and GDM, which he was able to share with his colleagues at his duty station in Tanzania.

In conclusion, the journey of Dr. Emanuel Chogo clearly contributed to objective 1 and 4 but was documented here under objective 4.

### 3.3. Lessons Learnt

#### 1) In rural African settings, do a one-off routine glucose measurement using capillary blood

Even in the outer East African periphery there is a growing proportion of the population affected by NCDs, foremost cardiovascular diseases, but also, even if less, by type 2 DM, malignant tumours and chronic obstructive pulmonary diseases. Our study showed a GDM prevalence in a rural district of 12.8%, if diagnosed with the standard 75g oGTT using venous blood. AW Mwanri found 1% in a rural setting and in the townships of Kinondoni and Tememe in Dar es Salaam, GDM prevalence according to her was at a level comparable to European countries (5% to 6%). However, prevalence data differ depending on the screening test and diagnosis criteria used. To the best of our knowledge, in our cohort the standard 75g oGTT using venous blood was applied for the first time in Tanzania. Thus, we presume that the GDM prevalence in the above-mentioned townships would even be higher than in Europe if the standard 75g oGTT screening using venous blood would be applied. Therefore, the assumption is justified that the recently emerged NCDs, including GDM, will further emerge and gain relevance. Thus, this also now allows answering the 3rd lead question of this project **“Can the lessons learnt from the implementation of the project at Lugala, based on the North-South partnership, allow recommendation of up-scaling within and beyond Tanzania?”**. The lesson learnt from this project allows for the following recommendations: **In rural African settings, do a one-off routine glucose measurement using capillary blood between the 24<sup>th</sup> and the 28<sup>th</sup> week of gestation. Advise the patients to go for further investigation and a proper DM and GDM diagnosis, in case this value is above the normal range. However, this requires that the health authorities:**

- a. have a rough idea of the GDM prevalence in their setting
- b. keep track of changing prevalence and switch to another procedure in case prevalence increases

#### 2) Transmitting knowledge about life style and nutrition in a poor socio-economic context isn't the easiest undertaking

Malinyi District is one of the poorest districts out of 184 districts in Tanzania. Per caput income is < 300 US\$ per annum, main source of income is smallest scale farming, stunting proportion reaches 48% and Illiteracy proportion 60 % of the population. To transmit knowledge about life style and nutrition in a such socio-economic context isn't the easiest undertaking. Changes can only be expected and achieved over time via repeated and possibly continuous flow of information. Consciousness for health promotive life style changes has been raised and activated by the here presented project activities. The project succeeded to trigger a critical mind regarding all kinds of foods and drinks. E.g. one can observe that those who participated in one of ESTHER-supported trainings drink water now instead of soft drinks.

#### 3) Look beyond the expected outcome of the project and learn from the unexpected

The striking difference between the number of women, who visited the RCH at LLH for antenatal care services, and the number of women, who delivered at LLH, reflects two major public health problems in Tanzania:

- a. Instant need for data management training for the responsible health staff.
- b. High number of home deliveries or deliveries at lower quality health facilities due to financial constraints

## 4. Project Management

### 4.1. Project Organisation

The trilateral partnership was implemented in a concerted action of LUKS, LLH and SolidarMed. The three partners jointly took responsibility for the project's implementation according to the project's documents and agreements. Each institution had defined roles:

- LLH as main beneficiary: improve local human resource in terms of technical knowledge and skills and host of Swiss colleagues
- LUKS: provide technical knowledge and skills, expose Swiss colleagues to rural African hospital realities and host Tanzanian colleagues
- SolidarMed: provide context specific public health expertise, administratively and operationally support and coordinate the partnership, and disseminate lessons learnt through its established channels

LUKS was assigned the leadership of the project and acting as a contractual counterpart to ESTHER Switzerland. It had to ensure efficient use of funds, reporting as well as fulfilment of administrative requirements. LLH was the implementer of the project with designated supervisors. SolidarMed assumed responsibility of the financial management of the funds. A steering committee including all three partners was established, met and discussed progress after schedule. There were channels for ad-hoc consultations and technical advice when need arose. The Ministry of Health oversaw the project throughout the project's cycle.

### 4.2. Monitoring & Evaluation, Reporting

For the GDM study, direct outputs were measured through the well-established routine monitoring at LLH. During the partnership and exchange visits qualitative assessment and feedback cycles were used to assess success and areas that needed further improvement. The project was supervised by the steering committee that included all three institutions. At operational level the medical officer in charge of LLH was acting as contact person in the South and stood in close contact with LUKS and SolidarMed as partners in the North.

Reporting included a narrative report about project outputs and results as well as a financial report, which will be submitted after the external audits in Tanzania and Switzerland. According to SolidarMed procedures, quarterly financial reports were compiled and validated. External financial audits take place once per year, both in Tanzania and Switzerland, applying the Swiss Development Cooperation terms of reference. SolidarMed's institutionalized internal controlling mechanism was applied to control disbursement and appropriate use of funds.

### 4.3. Knowledge Management, Actions Research & Capitalisation

Knowledge acquired during the project was actively discussed with all stakeholders involved and used for policy dialogue during a final GDM symposium at the end of the project.

When	What	Target group	Comment
July 2017	Visit North - South	LLH & district health staff	Capacity building & intercultural learning
October 2017	1 <sup>st</sup> visit South - North	LLH & district health staff	Capacity building & intercultural learning
November 2018	1 <sup>st</sup> visit South - North	Tanzania medical officer in-charge LLH	Capacity building, networking, partnership strengthening
December 2018	GDM symposium	Health authorities from the regional and district level, including surrounding districts	Networking, partnership strengthening, policy dialogue (incl. participation of District commissioner)

## 5. Expenses / Budget

The final financial report will be submitted as agreed by the end of March 2019 after the external audits in Tanzania and Switzerland.

## 6. Sustainability and outlook

Sustainability is understood as a process taking place at different levels.

Partnership level: All contracting partners were engaged to create a sound base for a mid-term/long-term partnership. Partners learned to know each other in their respective contexts and setting and planned and implemented activities jointly. The mutual visits certainly contributed considerably to a joint understanding and a level of trust. On the Tanzanian side health authorities at all levels were involved from the scratch. LLH has a good perspective for further improving its services and ensuring quality of diagnosis, therapy and patient care, if backed up in the initiated hospital partnership. On the other hand, LLH's potential for learning of health personnel from Switzerland was recognized well by colleagues from LUKS. The partnership has the potential to grow further, include more technical areas and catalyse further exchange of skills and knowledge. Future cooperation depends on interest, commitment and good will from both sides as well as funding in order to fully use the potential for exchange, mutual learning, generation of new evidence, and finally improvement of health care both in the South and North.

Concretely, a meeting between LUKS and SolidarMed will take place in July 2019 in order to discuss a possible way forward of the partnership and to discuss how the technical exchange between LUKS and LLH can continue. If funding becomes available, the partners would be happy to extend the scope of a possible next project to the lifelong management of patients with diabetes mellitus or hypertension.

Health system level: Integration of GDM/DM screening of pregnant women into routine services is planned at LLH. As SolidarMed is currently still implementing a project on newborn and maternal health in that project area (including at the LLH), a follow-up of the implementation of this activity is ensured. However, sustainability of the improved capacity of the LLH to screen and provide services for pregnant women with diabetes also depends on the continuous commitment of the persons who were involved in project implementation and is thus not fully in the hands of SolidarMed.

Policy level: As described in chapter 3.1., policy influencing is a longer-term process. As the screening is being integrated into the routine services of LLH, data and evidence will be added, which will strengthen the position of LLH to engage into policy dialogue and influencing.

Individual and patient level: The generated evidence regarding the prevalence of GDM in the district informed the health managers. This helped to improve and adapt the services for the patients. The improvement of knowledge and skills of the health staff about GDM, DM as well as nutrition and lifestyle not only benefits pregnant women but also other patients. The same is true about the findings from the diabetes community screening. Thus, the project had a positive overspill effect beyond the target group.

## The story

25-year old Salvina, at left in the below picture, has type 1 DM. Usually, type 1 DM is 'untreatable' at village level and patients don't reach Salvina's age. Salvina's blood sugar is well monitored and controlled, she is healthy and attends secondary school Form III. Her father Abel (at centre in the below picture) is Clinical Officer at LLH and has sound basic knowledge about diabetes. He constructed a local refrigerator sheltered in a lid covered bucket that keeps insulin cool.



Ch Henzen and I Kruppenacher at Diabetes-outreach visit at Navigo village with Salvina (at the left) and her dad, Abel (in the centre)

In principle the 'local refrigerator' functions as follows: Insulin is stored in a former coffee lid-covered tin can (at centre of the below picture), surrounded by pieces of charcoal in an inner bucket. This inner-bucket has a perforated base and fits into an outer bucket that is filled with about 5 cm water level. The charcoal pieces must be poured over with water every 3 to 4 hrs. The water permeates through the charcoal's capillaries and evaporates slowly from its surface. Evaporation generates coolness. Even if the temperature inside the tin can is above the requested 4° to 8° Celsius, Abel's experience is that for about a week the stored insulin is effective. After a week he discards the insulin that is residual in the vial.



Self-constructed local refrigerator with the coffee lid-covered tin can in the centre surrounded by charcoal

Abel promotes the 'local refrigerator' and in the meanwhile there are three more operational at village level. While prevalence of type 2 DM is at about 2%, prevalence of type 1 DM is still very low, but those who are affected suffer a high individual disease burden and often premature death. Salvina's situation is exceptional but it is encouraging and shows that not much is needed to ensure good quality of life of people living with type 1 DM in a distant rural African village: basic knowledge and commitment.

## Annexe A: Acronyms

Acronym	Meaning
APGAR score	New born assessment score after 1 and 5 minutes (created by Virginia Apgar)
BMI	Body Mass Index
DC	District Commissioner
DM	Diabetes Mellitus
GDM	Gestational Diabetes Mellitus
LLH	Lugala Lutheran Hospital
LUKS	Luzerner Kantonsspital (Lucerne Referral and Teaching Hospital)
NCD	Non-Communicable Disease
oGTT	Oral Glucose Tolerance Test
RCH	Reproductive and Child Health
ToT	Trainers of Trainers

## Annexe B: References

Title, topic	Source
Gestational diabetes mellitus in Tanzania – public health perspectives	Akwilina W Mwanri, PhD thesis, Wageningen University, Wageningen, The Netherlands, 2015
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