



# REVIEW AND LESSONS OF A NEUROLOGY SPECIALIST VISITING SOUTHERN DARFUR

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## ABSTRACT

**PURPOSE:** This article is aimed at describing activities and findings of western-trained medical specialist visits to Nyala, the capital of Southern Darfur. This remote part of western Sudan is home for many internally displaced people (IDP) following well-known armed conflicts, and is a major financial centre and marketplace in Darfur. Cities and towns in Darfur are over populated, causing an increasing burden on under-resourced and underfunded health services. Activities of these medical missions include provision of specialist medical services and assessment of the existing infrastructure for any possible future development of local health services tailored to the specific areas explored.

**STUDY DESIGN:** A local healthcare provider planned an ongoing healthcare programme called Visiting Specialist. It was developed and sponsored by the Southern Darfur Branch of National Health Insurance Fund to help people of this remote and deprived region of Darfur. The programme was inspired by the difficulties endured by patients travelling a very long distance to the capital Khartoum at very high costs. Implementation of this seemingly popular healthcare programme narrowed the technical medical sub-speciality and healthcare gaps. These visits are meant to be bridges of communication extended from the centre transferring services closer to people's homes at the peripheries.

**METHODOLOGY:** *The visiting delegates:* Two specialist visits were undertaken in November 2013 and January 2014, including Dr Isameldin Izzeldin, consultant neurologist and neurophysiologist, visiting from the United Kingdom; Dr Khalid Mohamed Eisa El-Talib, consultant physician and cardiologist, Al-Shaab Teaching Hospital, Khartoum; and Dr Asma El-Haj Ibrahim Abdel-Gadir, medical specialist registrar (rotation), Khartoum State Teaching Hospitals. *The receiving delegates:* the visiting team was received and welcomed by a well-assembled enthusiastic team from the Southern Darfur Branch of the National Health Insurance Fund, including managers of the different serving departments including public health, medical services, pharmacy, laboratory, transport and information. This team was headed by Dr Hatim Adam Nagi, Executive Director, Southern Darfur Branch, The National Health Insurance Fund, Senior and Experienced Consultant in Public Health and Community Medicine. The local team included personnel who normally looked after ongoing medical and health services on the ground, and additional personnel to ensure the success of the two visits and the visiting specialist programme as a whole. Local personnel worked hard to ensure the success of these missions, including the safety and comfort of members of the visiting team. The receiving team was far reaching and successful in managing the visit, starting with adequate advertising and publicity for the neurology clinics held, managing neurology referrals, establishing patients' registration, administering and running the clinics, patients' reception and introduction to clinics, trouble-shooting to ensure the smooth running of clinics, attending to the comfort and satisfaction of patients, and establishing a social work and economical assessment to support the poor

and needy patients. The visiting team was fully sponsored by the receiving team for travel, accommodation and subsistence, in addition to financial incentives to the visitors. The reception provided was excellent; however, considering the state of affairs in Southern Darfur and the local circumstances of the people, it was indeed an outstanding effort.

**FINDINGS:** Nyala city is served by a few public hospitals with specialists for the main branches of medicine, but with gaps in sub-speciality medical services catering for complex medical conditions. However, medical laboratories and radiology facilities are reasonable and appear to be in tandem with the capabilities of current local healthcare apparatus. Details of two consecutive visits of western-trained neurology specialist to Southern Darfur are discussed. The local settings, circumstances of local healthcare and issues related to caring for patients with neurological disorders are explored. Patients' demography, clinical information, presentation and management are discussed. Common neurological problems, mainly pain related and epilepsy, were treated locally and patients discharged; the majority of these were young and productive. This highlighted common neurological problems and identified immediate practical issues in training local medical and nursing staff. Important healthcare issues are discussed on local radio and television in a simple practical approach specific to the local needs and taking in consideration the available resources. This was aimed at raising public awareness on common neurological problems and addressing specific problems facing local people.

**CONCLUSIONS:** The neurological disorders encountered during these missions were found to affect the young productive members of this deprived population in Southern Darfur, mainly pain and epilepsy conditions. However, the majority of these neurological conditions were treatable and managed locally by the visiting specialist. Objective recommendations were raised to local health authorities to support efforts aimed at enriching patients' experience, which shall reduce public suffering partly by provision of specialist services and vertical care. This promotes an environment conducive for training medical and nursing staff, possibly assisting with relevant audits and research that would provide future vision, anchoring long-term planning. It is expected that this simple model of technology transfer of specialist medical services and expertise might assist local development and advance understanding of local healthcare problems.

**KEYWORDS:** Neurology; Internally Displaced People (IDP); Under-resourced; Underfunded; Health Services; Specialist Medical Services; Assessment; Darfur; Sudan.

**REFERENCE** to this paper should be made as follows: Izzeldin, I. M. H., Abdel-Gader, A. E. I., El-Talib, K. M. E. and Nagi, H. A. (2017) 'Review and Lessons of a Neurology Specialist Visiting Southern Darfur', *Int. J. of Sudan Research*, Vol. 7, No. 2, pp. 103–120.

## BACKGROUND

This visit was part of the ongoing programme called visiting specialist, which was sponsored and further developed by the Southern Darfur Branch of the National Health Insurance Fund. This was headed by the Executive Director, Dr Hatim Adam Nagi, who is an experienced consultant in public health and community medicine. The visiting specialist programme is meant to bring the specialist services of many medical and surgical specialties close to home. There is indeed a vast need for these rare specialty services in these peripheral and very remote regions of Sudan. The great difficulty and very high cost of travel are, in fact, inhibitive for ordinary people to reach the capital Khartoum. Therefore, this hinders people's attempts and limits their efforts, preventing them seeking health services in Khartoum.

It is hoped that the visiting specialist programme will enable patients in this remote region obtain specialist medical services close to home, avoiding otherwise difficult and expensive travel to the capital to seek these services. These obvious noble causes and strategic health reasons for launching the visiting specialist programme resonated with the understanding of the author, as with many other medical specialists. These specialists, who are morally represented here and expressed by the author, believed in coming close to the homes of humble and needy people living in remote peripheral regions of Sudan. In so doing, desperately needed specialist medical, surgical and health services are brought home, alongside specialist medical advice catering for patients, essential health education and awareness for individual patients and the communities.

In a specific specialty area covered, health awareness gained at the individual level was exemplified by patient management; in addition, family, carers and community levels surrounding patients managed by a specialist. This eventually translates into a better understanding of specialist health problems, specific care issues in surrounding communities and the whole region. No matter how slow, this eventually spreads knowledge, raises awareness, and introduces a culture of actively seeking medical advice, demanding better health care and asking for specialist services specific to health problems faced. This might be enforced by an overriding belief that better understanding of specific health problems eventually assists promoting better health and awareness of communities, and works towards the prevention of disease.

## THE TWO VISITS

An invitation was extended to the author and colleagues, and a working team was assembled. The team consisted of Dr Isameldin Izzledin, consultant neurologist and clinical neurophysiologist (author), and Dr Khalid M. Eisa El-Talib, consultant physician and cardiologist. On the second visit, the two consultants were accompanied by Dr Asma El-Haj I. Abdel-Gadir, a registrar in medicine. The team spent 2-3 days in Nyala holding specialist clinics for patients with neurology

and cardiology symptoms. Two parallel neurology and cardiology clinics ran independently<sup>1</sup>. On the second visit, procedures were discussed and agreed with the registrar (medicine) to create a filtering process to maximize the benefits of the specialist consultants' time; this filtering process would direct patients with appropriate specialty referrals to the consultants, rather than them seeing general medical problems manageable by local physicians. Hence on the second visit, the registrar acted as a triage, running an initial filtering clinic appropriately directing patients to further neurology and cardiology clinics to see specialists. If it was not necessary for them to be referred, they were treated or discharged by the registrar following discussion with the neurology or cardiology consultants.

## SETTINGS FOR THE TWO VISITS

**the description of the setting and findings is summarized as follows:**

### **NYALA, PEOPLE AND RESOURCES:**

Nyala is the capital of Southern Darfur, a centre for many displaced people and a major market city of Southern Darfur. It is a highly populated city with increasing loads on the health services. Hospitals serving the city are Nyala Teaching Hospital, with an Accident and Emergency department, Nyala Military Hospital, Maternity Hospital and the new Turkish Specialist Hospital. A number of consultant physicians see patients with general medical problems, but there is no sub-specialist cover for any of the medical sub-specialties. There are medical laboratories performing most of the major blood tests and some specialist requests. There are good X-ray facilities and a CT scanner at a centre attached to Nyala Teaching Hospital (well situated) and served by a specialist radiologist.

## CLINICS AND HEALTH CENTRE

The visiting clinics were set up at the Yashfeen Health Centre, the house of health services provided by the Southern Darfur Branch of the National Health Insurance Fund. The Yashfeen Centre is a purpose built, well equipped medical complex. It has OPD clinics, pharmacy, x-ray, haematology, biochemistry and microbiology laboratory, medical, paramedical and nursing personnel and reasonable number of clerical and support staff. A short-stay area serves acute medical and surgical patients, access to ambulance services linking and evacuating patients to A&E and the main hospital. The Yashfeen Centre is an active hub of medical/health services, including ongoing essential activities such as registration and management of the patient database, general medical and surgical clinics and follow-up, vaccination, mother and child health clinics, and education. It also houses administration, control, transport and financial units assisting medical and health services.

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<sup>1</sup> Services and outcomes of neurology and cardiology are to be discussed separately.

### A patient with severe O. Arthritis & Excellent Clinic Settings are provided



*Photos are courtesy of the author*

### Clinics are prepared and equipped to International Standards



*Photo courtesy of the author*

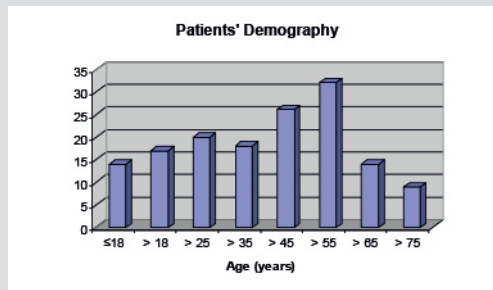
Patients were registered for the well-advertised and publicized neurology and cardiology clinics. Patients had already been pre-registered for the clinics based on referrals by medical doctors serving the general public, patients covered by the National Health Insurance, as well as patients referred by the consultant physicians. A significant number of patients were self-referrals, seeking neurology and cardiology services based on their general understanding of their own symptoms. Thus, the registrar-led triage clinic was introduced (on the second visit) to fine tune referrals and filter patients attending specialist clinics to improve the use of consultant's time and the overall outcome.

## NEUROLOGY FINDINGS AND OUTCOME OF THE TWO VISITS

In the two visits, an approximate total of 185 patients were seen by the consultant neurologist for a formal and full consultation, of either 30 or 15 minutes (International Neurology OPD Standard for new and follow-up patients,

respectively). In addition to this, approximately 38 patients with neurological symptoms were seen (on the second visit) by the Registrar and jointly managed following a discussion with the neurology consultant. Some proceeded to be seen by the consultant (included in main top figure) or discharged. The demographic data of patients are shown in Figure 1.

**Figure 1: Patient Demographic information**



*Source: Field research data by the author*

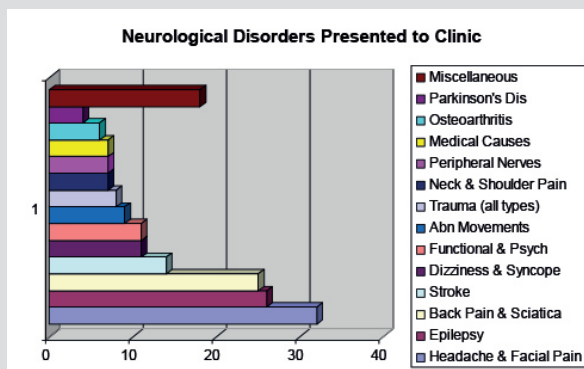
Looking at the demography of patients, it is obvious that the majority of patients presenting to clinics with neurological symptoms or disorders of the nervous system are aged 45-55 following by the 25-35 year age group. Nevertheless, patients of all ages (as young as children/teenage and as old as in their 80s or 90s) all presented to this clinic service. Looking at the breakdown analysis of symptoms or neurological problems presented as shown in Figure 2, it becomes obvious that the main categories or major reasons for referring patients to the neurology clinics are:

- headache and facial pain;
- epilepsy and related symptoms;
- back pain and sciatica.

These are followed by a significantly lower number of patients presenting with:

- Stroke (including recent or chronic associated with complications);
- Dizziness and syncope (possibly causally related to some functional symptoms);
- Functional, psychological and psychiatric disorders.

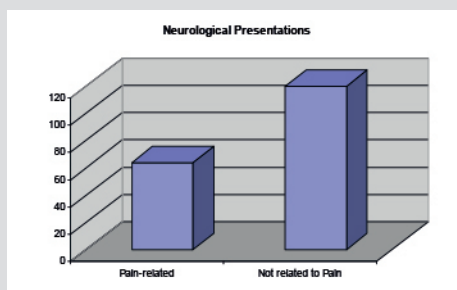
**Figure 2: Breakdown analysis of reasons or causes of referrals to the neurology clinic**



Source: Field research data by the author

A striking observation is that pain, as an independent symptom (adding all types, experienced at all locations in all parts of the central and peripheral nervous systems, locomotor and musculoskeletal systems), accounts for around one-third of neurological symptoms (one-third of patients referred with suspected neurological problems); this is shown in Figure 3. This observation is difficult to explain; however, it might be related to patients living in or close to conflict zones manifesting a multiplicity of health problems. These may include not only consequences of direct physical trauma but also elements of psychological trauma: fear, lack of inner security, sense of broken dreams and uncertain future. Subtly detectable clinically in patients presenting with various types of pain, it is particularly seen in vulnerable patients such as women and young patients usually confounded by issues related to poverty, illiteracy and internal displacement.

**Figure 3: Shows that one-third of patients present with pain-related symptoms**



Source: Field research data by the author



There was a wide range of neurological disorders seen in the clinic, including expectedly less prevalent conditions in this region such as Parkinson's disease and peripheral neuropathy. Further less common conditions, which were listed as 'miscellaneous' in Figure 2, are broken down in Table 1 below:

**Table 1: Less frequent disorders** (appeared as 'miscellaneous' in Figure 2)

Memory Problems	3
Cerebellar Ataxia / Diseases	3
Genetic and Congenital	3
Infection-related Presentations	2
Paraparesis (due to Pott's Disease and Spondyl. Dis)	2
Brain Tumours	2
Rheumatic Diseases	2
Motor Neuron Disease	1

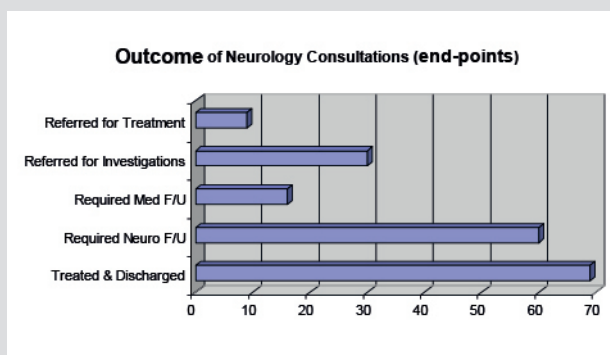
Source: Field research data by the author

It has also been observed in clinic that:

- *Trauma* is of high prevalence relative to what might be seen in the neurology (medical) clinic;
- Most patients with trauma suffered *head injury* (mostly caused by being hit with sticks);
- Most abnormal movements related to *trauma or stroke*, were mostly spasms or jerks;
- Most patients with symptoms of *dizziness and/or syncope* were related to some *functional* causes;
- Most patients aged  $\leq 18$ -years were *adolescents* (teenage) rather than younger children;
- A small minority of patients presented with *multiple neurological symptoms/problems*;
- A large number (around one-third) of the total number of patients presented with some form of *pain*.

An analysis of the outcome of consultations that eventually classified, filtered and directed patients seen at the neurology clinic, identified the estimated end-points as shown in Figure 4. This graph shows from these estimates that the Neurology Clinic resolved the majority of neurological referrals, clearly highlighted the need for further neurology follow-up, and identified patients requiring tests or further therapy to be performed in the capital Khartoum; this was only in a small minority of patients.

**Figure 4: Breakdown of Estimates of Outcomes of the Neurology Consultations**



*Source: Field research data by the author*

This estimated analysis shows that most outcomes of neurology consultations fulfilled the required expectations and might have been 'satisfactory'. This is because the outcome of consultations for most patients achieved feasible resolutions/solutions of the clinical problems presented. Most of these resolutions/solutions included advice, prescribed medicines or both. Advice and counselling were crucial in managing most of these patients. Advice included a thorough explanation of the nature of any disease, origin of the symptoms, education on the best way to deal with an illness, and mechanisms for living with a named neurological disorder, especially if untreatable. They also addressed the difficult issue of coping with disease and modifying activities of daily living (ADL) to remain mobile and independent for as long as possible.

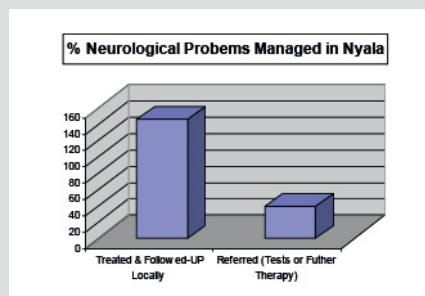
Comprehensive advice and counselling served the needs of many patients, answered multiple questions, addressed many concerns and saved the patients' time, effort and resources spent travelling to the capital. It is believed that a significant number of neurology referrals resulted in favourable outcomes. This might be partly suggestive that some patients might not have been in need of neurology referral in the first place, supported by the presence of self-referrals, or referrals caused by the presence of a visiting specialist triggering patients to seek

reassurance or a check-up rather than actual symptoms highlighting the need for a genuine neurological referral.

In Figure 4, adding a column labelled 'Treated and Discharged' to other two columns of patients requiring a neurology or medical follow-up (patients with neurological and/or medical diagnoses), totals an approximate figure of over 75% of all patients seen in the clinic. This means that roughly three out of four (three-quarters or 75%) patients seen in the clinic were fully managed locally in Nyala (shown in Figure 5), indicating that patients were either treated and discharged or treated and required a further neurology follow-up locally. It is suggestive that this outcome addressed clinical problems presented to clinic.

It is likely that the neurology clinic service offered satisfactory resolution/solutions to patients; however, there was no formal feedback to gauge patient satisfaction. Informal feedback received in clinics from patients, carers and families, community and local media is positive and encouraging.

**Figure 5: Proportion of patients with neurological symptoms treated locally Nyala**



*Source: Field research data by the author*

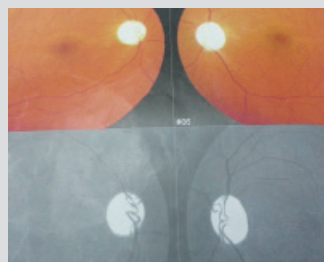
The success of setting up neurology clinics as part of the visiting specialist programme is seen in the fact that a large number of the patients under the column, 'Treated & Followed-Up Locally' might have been forced to travel to the capital Khartoum seeking specialist neurology opinions. It is therefore possible to conclude that these local neurology clinics possibly saved potential referrals or actual travel for around 75% of patients presenting neurological symptoms or experiencing neurological problems. This left a small proportion of patients who the consultant neurologist recommended to travel to the capital for investigations and further therapy that are necessary and affect treatment but are not available locally. Tests highlighted as needing to be performed frequently in Khartoum for patients visiting local neurology clinics included Electrophysiology (EEG, NCS and EMG), neuro-imaging (MRI brain and spine, MRA, MRV, Special CT Scanning) and Special Blood Tests.

**Example Patients:** Photo A shows a child with a head injury, convulsions, fever and plaster overlying an infected scalp wound (sent for inpatient treatment). Photo B shows retinal photographs of a woman with long-standing headaches, normal brain MRI/V and Bilateral Partial Optic Atrophy of Idiopathic Intra-cranial Hypertension (complex clinical problem for close neurology follow up).

Photo-A: Infected Head Wound



Photo-B: Optic Atrophy Secondary to IIH



**Filtering Clinic (Registrar in Medicine):** Data collected by **Dr Asma Abdul-Gadir**

During the second visit, a filtering clinic was set up for the medical registrar, Dr Asma E.I. Abdul-Gadir to sort patients on their arrival heading towards the consultant-led specialist clinics. Filtering proved a great success in sorting, diagnosing and treating general medical problems by the Registrar, then redirecting patients requiring complex and specialist treatment to the neurology and cardiology consultants. The statistics from registrar clinics are shown in Table 2, breaking down various medical problems seen, calculated percentages and the total number of patients, which was 181.

**Table 2: Statistics of Registrar-led Clinics with fifth of patients presenting neurology problems**

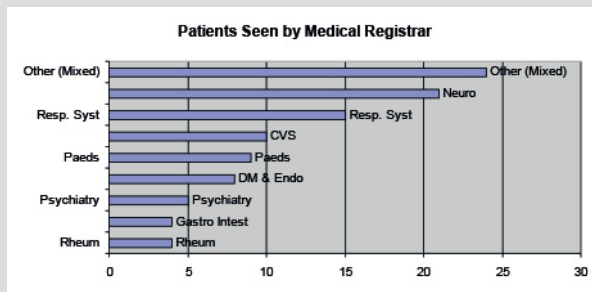
Systems involved	System Diagnoses	%
Rheumatology	Joint Pain, Joint Swelling, Osteoarthritis	3.8
Gastro-intestinal	Gastritis, Peptic Ulcer	3.8
Psychiatry	Mood Disturbance, Schizophrenia (?)	4.4
Diabetes & Endocrine	Diabetes, Generalized Fatigue Impotence Goitre / Hyperthyroid Symptoms/Signs	7.7
Paediatrics (under 16-years)	Cerebral Palsy, Learning Disability Recurrent Tonsillitis (URT)	9.3

**Table 2: Statistics of Registrar-led Clinics with fifth of patients presenting neurology problems (continued)**

Systems involved	System Diagnoses	%
Cardio-vascular	CHF, Rheumatic Heart Disease, IHD	10.4
Respiratory	Respiratory infections, Other chest (?)	15
Neurology	Abnormal Movements, Headache Stroke, Carpal Tunnel Syndrome	21 (38)
Others (Mixed)	Swelling / lumps, Vague symptoms	24.6
Total Patients	N = 181 Patients	100 %

Source: Field research data by the author

The statistics shown in Table 1 and the breakdown of symptoms and diagnoses of patients seen by the Registrar shown in Figure 6, reaffirm the perceived efficiency gained by filtering patients reporting to the advertised clinics. An additional 38 patients with neurological symptoms/problems were seen, comprising 21% of the total number of patients who reported to the registrar clinic. A breakdown of all other medical problems, calculated percentages and total (181 patients) seen are shown in Table 2.

**Figure 6: Statistics of Registrar-led Clinics with fifth of patients presenting neurology problems**

Source: Field research data by the author

The high number of patients reporting neurological symptoms/problems among general medical patients is possibly a selection bias caused by the effect of adverts and media on increased referrals. The perceived benefits of a registrar-led filtering

clinic of general medical patients are obvious. If the filtering clinic was not arranged, this data confirms that an additional 181 patients might have to be seen. These extra patients would have been filtered and managed by the specialist consultants, even though they only had general medical problems that are manageable at the registrar level (with or without discussion with a consultant). The additional 38 neurology patients could have added 10 working hours (15 minutes each) to the neurology consultant's work load. Obviously, the effectiveness of the filtering clinic increased the total number of patients with neurological symptoms/problems seen and fully managed to  $(185 + 38 =) 223$ . These patients were all seen in Nyala, Southern Darfur under supervision of a specialist consultant.

## LOCAL MEDIA: INFORMING OF CLINICAL SERVICES & HEALTH EDUCATION

There was a wide and good coverage for the visiting specialist programme, steered by the communication department of the Southern Darfur Branch of the National Health Insurance Fund. This was to ensure public awareness of the visiting team and the specialties clinics being held locally in Nyala so patients would seek the appropriate steps to eventually attend the clinics and benefit from specialist services.

## RADIO AND TV TALKS AND PROGRAMMES

Radio and some TV broadcasts that accompanied the two visits included the following:

1. TV report + field interviews (visiting specialist programme) + public health advice;
2. Radio report + field interviews (same reports made for TV) were broadcasted on radio;
3. Radio evening programme (health education + life questions and answers);
4. Radio evening programme (on visiting specialists' programme) with Dr Hatim Adam Nagi;
5. Radio evening interviews (public health awareness of heart and brain disorders and risks for vascular diseases (excellent dialogue) with Dr Hatim Adam Nagi.

## MEDIA AND HEALTH EDUCATION

The radio and TV broadcasts, which reached millions of people all over the Darfur region, are used to reach listeners and viewers for the purpose of health education, raising public awareness and delivering vital messages and lessons in the speciality areas served.

Topics covered in radio and TV shows (lectures, interviews and question and answer sessions) are:

1. **Vascular Risk Factors:** definition, link to diseases, disease burden on patients and the public;
2. **Healthy Living Advice and Healthy Life Style:** prevention of cerebral vascular disease (stroke);
3. Cerebrovascular disease (**stroke**): definition, causes, symptoms, recognition, burden, treatment;
4. **Headache:** causes and treatments;
5. **Back Pain and Sciatica:** causes and life style;
6. **Epilepsy:** causes and types (an organic, potentially treatable disease, fighting the social stigma).

## EDUCATION AND TRAINING OF JUNIOR DOCTORS AND ALLIED HEALTH WORKERS

There were a few local specialist physicians who referred patients to the neurology clinic, with two who attended the clinics for joint consultation, discussion and feedback on a number of referrals seen. There are a number of junior medical colleagues, sisters and nurses who attended the neurology clinic and received feedback on the clinical assessment of neurological symptoms and full neurological examination of patients. Communication skills used in counselling, giving advice, explaining symptoms and diseases and breaking news are practiced and elaborated on. A single lecture was held on the second visit for local physicians and junior medical doctors. These covered topics including neurological emergencies, essentials in stroke and epilepsy and neuro-radiology (brain CT scan).

## CONCLUSIONS

It is obvious that the two visits by the neurology consultant achieved many of the anticipated goals. In addition there were many more unexpected collateral benefits, such as boosting the morale of local colleague physicians, junior doctors and health care workers. Above all, patients were served at high standards of care catering for their carers, and their families all have expressed words of satisfaction felt in the community and expressed by the local media. However, time, effort and resources were short of the expectations (of the receiving and visiting teams) for wider, more equitable coverage of the city's population who required specialist services. This had to be left as inspiration for future higher quality/better coverage.

### Stroke Patient and Carers under the Shade of a Tree



## RECOMMENDATIONS

These two visits concluded lessons and extrapolated visions for future:

- To provide neurology clinics in Nyala for new patients presenting with neurological symptoms;
- To provide follow-up clinics for patients with known/stable neurological symptoms/problems;
- To continue support and funding for the visiting specialist programme, improving its methods;
- To involve relevant and related specialties (e.g. rheumatology and orthopaedics) to neurology);
- Enriching patients' experience, fully addressing symptoms in question, complete quality services;
- Delivery, enhancing education and training of local medical and nursing staff (by setting examples);
- To involve scientific and research methods (including surveys, patient satisfaction questionnaires, statistics and audits) to draw conclusions, and extrapolate lessons that would enable the future vision for services.



## ACKNOWLEDGEMENTS

Sincere thanks to the dedicated team from the Southern Darfur branch of the National Health Insurance Fund (NHIF) who made these visits possible. Thanks to the local specialists, junior medical colleagues and nursing staff for facilitating and greatly assisting in enhancing patients' experience. Many thanks to the very kind people of Nyala and Southern Darfur who travelled long distances and waited at the clinics with grace and patience offering us the pleasure of serving them.

## BIOGRAPHY

**Dr Isameldin M. H. Izzeldin** graduated in 1994 with an MBBS from the University of Khartoum, Sudan. He was medically trained in Sudan then Saudi Arabia, where he became Senior Neurology Resident at the Tertiary Neuroscience Center in Riyadh. In 1999, he moved to the UK taking various medical and neurology posts and obtaining a full MRCP (UK). He was a specialist registrar in neurology at Hull Royal Infirmary under the Yorkshire Deanery, University of Leeds. He joined the University of Strathclyde as clinical research fellow and completed a research project towards a PhD. He joined Oxford Teaching Hospitals as specialist registrar in clinical neurophysiology under the Oxford Deanery, obtaining CCT. He worked as a consultant in neurology and clinical neurophysiology, obtained FRCPE, FRCPSG and became an MRCP-UK PACES Examiner. He worked as Associate Professor of Medicine and Neurology, University of Khartoum until 2012, publishing in journals. Currently, he is a consultant neurologist and clinical neurophysiologist in the UK.

**Dr Asma E. I. Abdel-Gader**, graduated in 2005 with an MBBS from the University of Khartoum in Sudan. She was medically trained in Sudan, doing an internship from 2005 to 2007, then a medical rotation obtaining her MD in Medicine from SMSB, Sudan in 2015. She completed the MRCP (UK) in 2016. She worked as a medical specialist in several teaching hospitals and did research on 'Risk factors and common clinical presentation of pulmonary embolism'. Currently, she is working as a medical specialist in respiratory medicine at the Ibrahim Malik Teaching Hospital, Khartoum, Sudan.

**Dr Khalid M. E. El-Talaib** graduated in 1998 with an MBBS from Gazira University in Sudan. He was medically trained in Sudan, doing an internship rotation from 1998 to 2000 and cardiology training from 2011 to 2014. He obtained his MD in medicine from SMSB, Sudan in 2005, and a Fellowship in Cardiology from SMSB, Sudan in 2014. He is currently working as an Assistant Professor at Kordofan University, Sudan. He has undertaken local research projects and has published in peer reviewed journals.

**Dr Hatim A. Nagi** graduated in 2000 with MBBS from Alfashir University, Northern Darfur, Sudan. He was medically trained in Sudan, doing internship and medical rotation in teaching hospitals in Khartoum and Darfur, Sudan. He obtained a Master of Public Health (MPH) from Malaya University, Kuala Lumpur, Malaysia in 2006, and completed an MD in Community Medicine from SMSB, Sudan in 2009. He worked as a community physician and took administrative and leadership roles including becoming Executive Director for the National Health Insurance Fund for Southern Darfur, Sudan. He was the director of planning, director of preventative medicine and national coordinator for some national surveillance. He took part in development and implementation of scientific and IT approaches to improving local health standards and quality health services.