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RESEARCH PAPER

A Report Highlighting the Role of King Salman Relief Centre in Providing Physical Rehabilitation for the Landmine Victims in Yemen

Dr Samer Aljetaily
King Salman Humanitarian Relief Center, Riyadh, Saudi Arabia
Email: s.aljetaily@ksrelief.org

Professor Dr Amen Bawazir
Department of Basic Medical Sciences
College of Medicine, AlMaarefa University
Riyadh, Saudi Arabia
Email: abawazir@mcst.edu.sa

Dr Loujayn Alhokail
College of Law and Political Science, King Saud University, Saudi Arabia
Email: ljhokail@gmail.com

Professor Dr Omar Hasan Kasule
College of Medicine, AlMaarefa University Riyadh, Saudi Arabia
Email: omarkasule@yahoo.com

Dr Wasif Ali Khan
Department of Basic Medical Sciences
College of Medicine, AlMaarefa University
Riyadh, Saudi Arabia
Email: wkhan@mcst.edu.sa

Dr Shahabuddin Shaikh
Department of Basic Medical Sciences
College of Medicine, AlMaarefa University
Riyadh, Saudi Arabia
Email: sshaikh@mcst.edu.sa

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ABSTRACT

PURPOSE: The purpose of this study is to explore the role of King Salman Relief Centre (KSRC) in providing prostheses and orthotics to amputation victims of landmine explosions in the conflict zone in Yemen.

DESIGN/METHODOLOGY/APPROACH: Aggregated secondary data from KSRC were analysed. Variables used include sex, age group, affected limb, type of intervention, and area of residency. Data were entered into an Excel spreadsheet and further analysed using numbers and percentages.

STUDY FINDINGS: A total of 6,351 prostheses and orthotics were provided for people affected with amputations as a result of landmine explosions over a period of three years (2020-2022) in Yemen. The project was implemented in 14 governorates of Yemen. Under the project, the majority of the limb prostheses (53.2%) and orthoses (46.8%) were provided for lower limb amputations (60.3%) due to landmine explosions in addition to those for other medical reasons (36.8%). Up to 3% of the prosthetics and orthotics were provided to victims of landmines who had their upper limbs amputated. Most of the beneficiaries of the interventions were adults (65.2%), of which 85.9% and 14.1% were males and females, respectively. The remaining 35.8% of beneficiaries were children under 18 years of age (boys comprising 64.3% and girls 35.7%) two-thirds of which were under 15 years of age.

ORIGINALITY/VALUE: This is the first study in Yemen to explore the role of KSRC; however, the lessons learned from the correlation of the intervention study with the aid efforts can be used as a guide by KSRC themselves as well as by the other organisations working to deliver medical aid to conflict-ridden countries, to better manage the precious resources, and to identify any lacunae that may hinder full utilisation of the relief efforts. The data generated through these efforts can be used to further improve the efficiency of the relief effort and can guide policy-makers to judge the effectiveness of the project. This is in addition to utilising the resources diligently and closing any lacunae in the form of under-representation of any particular group of sex, age or geographic location. The study can be broadened further to include the parameters related to lifestyle, economic, and psychological benefits to the victims.

RESEARCH LIMITATIONS/IMPLICATIONS: A clear correlation between the actual levels of mine contamination in Yemen is not yet clear as ongoing armed conflict still acts to add to the extent and complexity of contamination, including improvised mines. Economic implications and other variables to assess the consequences of the intervention as well as amputations were not collected; this should be included in further studies.

PRACTICAL IMPLICATIONS: Disadvantaged countries, such as Yemen, with limited economic resources, have many obstacles to rehabilitating landmine victims due to low societal awareness, low resources, as well as the existence of war. Therefore, KSRC is an example of an effort contribution to provide much-needed humanitarian assistance and physical rehabilitation as part of health sector programmes.

KEYWORDS: *Landmines; Prostheses; Orthotics; KSRC; Yemen*

INTRODUCTION

Limb amputation is one of the common causes of disability in humans, leading to a significant reduction in mobility, economic deprivation, and a negative impact on the quality of life. Conflict zones, especially in a country like Yemen, that are suffering from the scourge of war have a vast area covered with hidden landmines leading to a significantly higher incidence of people suffering from limb amputations.

The Saudi "Masam" demining project was launched in 2018 with the aim of removing mines. It started with a land survey followed by clearance operations that were conducted in 21 governorates and 233 districts, covering over 23 million square metres of Yemeni land. The total number of

mines dismantled since the beginning of the project, to this point in time, is 322,789; the project is expected to run until the end of December 2026 (Dashela, 2022).

An amputated limb can be replaced with a prosthesis to restore mobility and enhance the quality of life. During the pre-prosthetic phase of rehabilitation, a victim with a lower extremity amputation must retain as much limb function as possible (Walsh and Walsh, 2003). Disadvantaged countries, like Yemen, with limited economic resources, have many obstacles to rehabilitating landmine victims due to low societal awareness, low resources, as well as the existence of war. Therefore, the King Salman Relief Centre (KSRC) plays an important role in providing much needed humanitarian assistance and physical rehabilitation as part of health sector programmes. In addition, the centre has recently declared that more assistance will be provided with physical rehabilitation services and follow-up for people with special needs to enable them to contribute to community service (SPA, 2022).

This study aims to explore the role of KSRC in providing prostheses and orthotics to amputation victims of landmine explosions in the conflict zone in Yemen.

METHODS

Study Design and Settings

This study is an explorative cross-sectional type based on the available aggregated secondary data from KSRC. Activities related to this programme were conducted in 14 governorates in Yemen (Abyan, Ad Dali', Aden, Al Bayda, Al Hodeida, Al-Jawf, Al-Maharah, Hadramawt, Hajjah, Ibb, Lahj, Ma'rib, Shabwah, and Taiz) through the period 2020-2022.

Participants

Participants with amputated limbs from the conflict zones in Yemen were included in this study. For the study purpose, participants were divided into two categories, either disability due to an accident involving landmines that led to trauma or those patients with disability, not due to landmines (e.g., vehicle accident, logging accident) or due to medical illness (e.g., diabetes).

The main included variables were those related to the demographic characteristics of the included populations, such as sex, age group, and the area of residency mainly the governorate, and those variables related to the intervention, such as the affected limb, and type of intervention. Data were entered into an Excel spreadsheet and further analysed using numbers and percentages.

RESULTS

Table 1 shows humanitarian support provided by the KSRC, either in the form of prostheses or orthoses provided for people affected by amputations because of landmine explosions in Yemen. The cumulative number of interventions during the years 2020, 2021, and 2022 were 1,697 (26.7%), 2,627 (41.4%), and 2,027 (31.9%), respectively (Figure 1).

Table 1: Distribution of the Intervention of Prostheses or Orthoses to Landmine Victims in Yemen (2020-2022)

	2020		2021		2022		Total	
Governorate	No.	%	No.	%	No.	%	No.	%
Taiz	653	38.5	1072	40.8	812	40.1	2537	39.9
Al Jawf	469	27.6	395	15.0	402	19.8	1266	19.9
Hadramawt	12	0.7	339	12.9	279	13.8	630	9.9
Aden	256	15.1	259	9.9	104	5.1	619	9.7
Al Hodeidah	64	3.8	62	2.4	140	6.9	266	4.2
Shabwah	65	3.8	117	4.5	74	3.7	256	4.0
Ma'rib	88	5.2	59	2.2	74	3.7	221	3.5
Lahj	42	2.5	87	3.3	66	3.3	195	3.1
Ad Dali'	0	0.0	124	4.7	50	2.5	174	2.7
Abyan	17	1.0	48	1.8	1	0.0	66	1.0
Ibb	0	0.0	43	1.6	1	0.0	44	0.7
Al Bayda	31	1.8	0	0	0	0	31	0.5
Hajjah	0	0.0	22	0.8	5	0.2	27	0.4
Al Maharah	0	0.0	0	0	19	0.9	19	0.3
Total	1697	26.7	2627	41.4	2027	31.9	6351	100.0

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

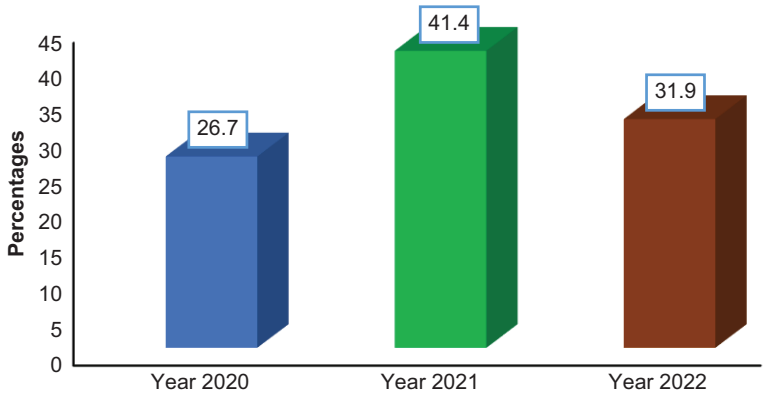

Figure 1: Intervention by Years (percentage of total interventions) 2020-2022

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

The project beneficiaries were residents of the following 14 governorates of Yemen: Abyan, Ad Dali', Aden, Al Bayda, Al Hodeida, Al-Jawf, Al-Maharah, Hadramawt, Hajjah, Ibb, Lahj, Ma'rib, Shabwah, and Taiz (Table 2). The largest number of beneficiaries of the interventions were

residents of Taiz (37.2%), followed by Al Jawf (21.4%) and Aden (10.8%). The lowest number of beneficiaries were from Hajjah and AlMahrah comprising 0.3%, and 0.2% respectively.

Table 2: Distribution of Beneficiaries Who Received Prostheses Based on their Residence in the Different Governorates of Yemen from 2020-2022

	Prosthesis		Beneficiary	
Governorate	No.	%	No.	%
Taiz	2537	39.9	1904	37.2
Al Jawf	1266	19.9	1098	21.4
Aden	619	9.7	555	10.8
Hadramawt	630	9.9	417	8.1
Shabwah	256	4.0	216	4.2
Al Hodeidah	266	4.2	236	4.6
Ma'rib	221	3.5	183	3.6
Lahj	195	3.1	182	3.6
Ad Dali'	174	2.7	167	3.3
Abyan	66	1.0	63	1.2
Al Bayda	31	0.5	29	0.6
Ibb	44	0.7	41	0.8
Hajjah	27	0.4	17	0.3
Al Maharah	19	0.3	12	0.2
Total	6351	100	5120	100

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

Figure 2 illustrates the rate of the beneficiaries by age group, in which two-thirds were adults (64.2%) and the rest were children (35.8%).

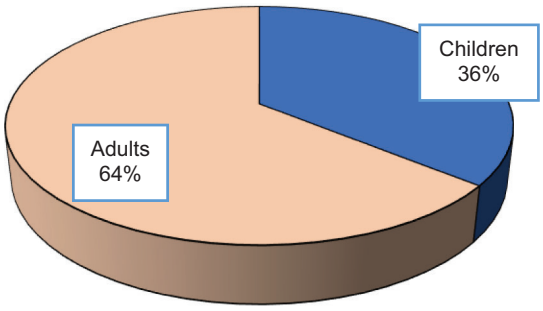

Figure 2: Received Intervention by Age as Children and Adults

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

Most of the beneficiaries of this project were adult men (64%); approximately half of these beneficiaries (51%) were provided with prostheses. The lowest rate of intervention was observed in women comprising 6% of the total (Figure 3).

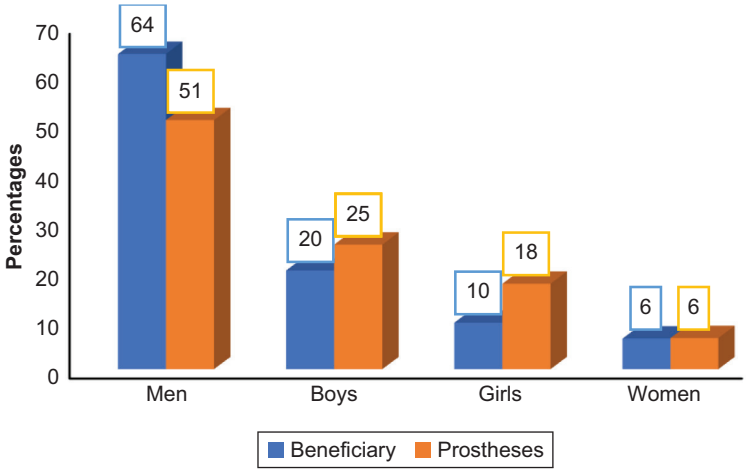

Figure 3: Shows the Distribution of Beneficiaries Who Received Prosthesis Interventions by Age and Sex

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

Figure 4 illustrates the rate of the interventions in the form of prostheses and orthoses based on the type of disability. Most interventions were carried out for lower limb amputations (60%), followed by those for medical reasons (37%). The lowest rate was related to landmine related trauma affecting the upper limbs (3.0%).

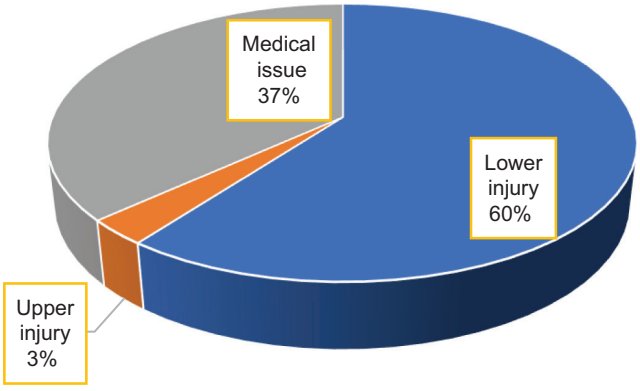

Figure 4: Interventions Reported According to the Type of Medical Issues, and Site of Injury

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

Figure 5 shows that prostheses (58%) were the most frequent interventions compared to orthoses (42%) in victims of landmines/Unexploded Ordinance (UXO) explosions.

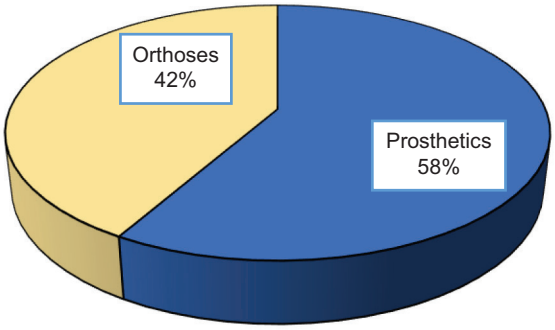

Figure 5: Shows the Distribution of the Type of Intervention in the form of Orthoses or Prosthetics

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

The use of prosthetics and orthoses depending on the site is illustrated in Figure 6. The interventions were carried out for either the upper or lower limb and sometimes for the backbone. Both prosthetics and orthoses were used in the intervention for the lower limb (94.2%, and 84.8%, respectively).

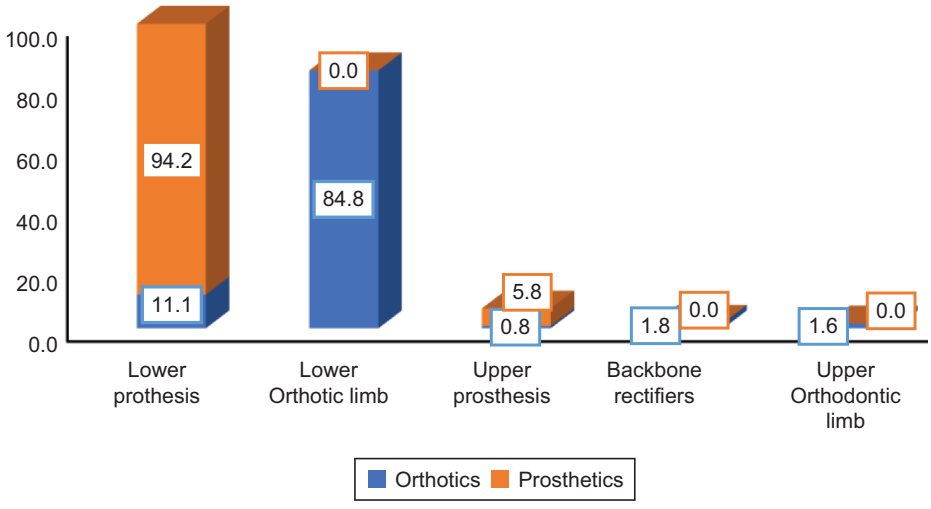

Figure 6: Elaboration of Provided Prosthesis by Type

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

Most of the interventions were carried out in males (85.9%), with approximately two-thirds of the interventions being carried out in those under 15 years of age. Of these, 64.3% were carried out in boys and 35.7% in girls. Backbone rectifiers and the use of lower limbs orthoses were carried out in children under the age of 15 years, while the lower prosthesis, upper limb orthoses, and upper prosthesis were more commonly implanted in adult victims (Table 3).

Table 3: Types of Prosthesis Implanted in the Different age Groups

	Backbone Rectifiers		Lower Limb Orthoses		Lower Prosthesis		Upper Limb Orthoses		Upper Prosthesis	
Age Group	No.	%	No.	%	No.	%	No.	%	No.	%
0-4 years	19	39.6	988	44.0	14	0.4	3	7.1	1	0.4
5-14 years	19	39.6	585	26.0	90	2.4	10	23.8	24	10.3
15-29 years	7	14.6	363	16.2	1529	40.4	14	33.3	104	44.6
30-44 years	1	2.1	191	8.5	1237	32.7	5	11.9	61	26.2
45-59 years	1	2.1	82	3.7	556	14.7	7	16.7	25	10.7
60-69 years	1	2.1	26	1.2	252	6.7	3	7.1	15	6.4
70-79 years	0	0	9	0.4	81	2.1	0	0	2	0.9
≥ 80 years	0	0	2	0.1	23	0.6	0	0	1	0.4

Source: Constructed by authors from secondary data collected from King Salman Relief Centre dataset

DISCUSSION

The study documents the exemplary work done by the KSRC in providing physical rehabilitation to the victims of landmine/UXO explosions in Yemen. The study highlights a large number of prostheses and orthoses as well as backbone rectifiers implanted in place of the amputated limbs and injured sites in economically deprived people of Yemen. We noticed that most beneficiaries of the project were adult males, the reason being that Yemen is a patriarchal society; males work outside in industries and on farms and travel frequently for business purposes or household chores, and thereby they are the main victims of war. However, children and women being the most vulnerable group are also at the receiving end of the scourge of the war. Due to poverty, there is pressure on children, particularly those under 15 years, to work outside or on farms leading to increased exposure to landmines. Children playing outside their houses also increases their risk of exposure to landmines. Although the relief efforts of KSRC are directed to all 14 governorates of Yemen, some areas, such as Hajjah and Almaharah, receive comparatively fewer interventions. This may be because fewer victims are located in these areas. Moreover, we believe by gathering these data we will help in streamlining the relief efforts, and the actual reasons for a smaller number of interventions in some areas need to be examined at the grassroots level. This will also help in directing some of the resources to these areas.

By providing physical rehabilitation, the KSRC has not only reduced the disability of these victims but also has given them a ray of hope for a better future. Interventions improve the mobility of the victims that may help in reducing their economic deprivation as well as improving their quality of life and alleviating several psychological issues they face.

Despite international efforts, landmine injuries and existing landmine fields continue to pose a substantial public health problem in many areas of the world (Moloney, 2009). The International Campaign to Ban Landmines (ICBL) estimates that there are 300,000-400,000 landmine survivors globally, while 2-5 million new landmines are planted each year (ICBL, 2022). The actual level of mine contamination in Yemen is not yet clear as ongoing armed conflict still acts to add to the extent and complexity of contamination, including improvised mines (UNDP, 2022).

Victims of land mine blasts often require extensive and prolonged medical care and rehabilitation; this is not usually available from already poorly funded and overstretched health services (Ryken *et al*., 2017). In addition, mine/explosive remnants of war (ERW) risk education remained a crucial intervention as people continued to live and work in contaminated areas and in states suffering ongoing conflict, including Yemen.

Since the establishment of prosthetics centres in Yemen by the KSRC, the amount of humanitarian work is enormous in terms of the number of interventions as well as the funds that have been allocated for the relief efforts (ICBL, 2022). The data generated through these efforts can be used to further improve the efficiency of the relief effort, and can guide policy-makers to judge the effectiveness of the project as well as to utilise the resources diligently and to close any lacunae in the form of under-representation of any particular group of sex, age or geographic location. The study can be broadened further to include the parameters related to lifestyle, economic, and psychological benefits to the victims.

CONCLUSIONS

KSRC plays an important role in providing physical rehabilitation by implanting prostheses and orthoses and alleviating people's suffering, especially vulnerable groups such as children, in Yemen affected by landmine explosions. Most of these interventions were used for lower limb amputations. The information gathered at the grassroots level is necessary to design successful physical rehabilitation and amputation or injury relief programmes in war-ravaged countries like Yemen, and to improve their efficiency to reach and benefit the affected people.

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BIOGRAPHY

Dr Samer Aljetaily has a Bachelor of Dentistry (1989), a Master in Advanced Prosthodontics (1994) and a PhD in dental implants (2001). He is currently a member of the King Salman Humanitarian Aid and Relief Center on the advisory board to his Excellency the General Supervisor of the Center. He is also a director of the Resource and Investment Department and an official Spokesperson for the Center. Dr Al Jetaily previously taught at the College of Dentistry at King Saud University as an Assistant Professor. He received a Golden Medal in 2020 from the Minister of Health for his work as a Health Volunteer.

Professor Dr Amen Bawazir MBBS, Epi DR, PhD graduated as a physician from the Faculty of Medicine and Health Sciences at the University of Aden, board degree in Public Health from Havana, Cuba, and a PhD from the Liverpool School of Tropical Medicine at the University of Liverpool, UK. As Dr Bawazir has worked in different universities, his teaching experience is extensive, and he recently joined the College of Medicine at AlMaarefa University, Riyadh, Saudi Arabia. Professor Bawazir has published a good number of highly cited articles in peer-reviewed journals, with a focus on cancer, non-communicable diseases, hepatitis, and family planning programmes. Professor Bawazir contributed to the International Humanitarian Mission in Pakistan during the Earthquake.

Dr Loujayn Alhokail is an Assistant Professor at the College of Law and Political Sciences, King Saud University, Riyadh, Saudi Arabia. She received her bachelor's degree from King Saud University in 2009, her LLM from Schulich School of Law, Dalhousie University, Canada in 2014, and her PhD in law from Osgoode Hall Law

School, York University, Toronto, Canada in 2021. In addition to working as an assistant professor, Dr Alhokail has worked as a consultant for several organisations including King Salman Humanitarian Aid and Relief Center, Riyadh, Saudi Arabia.

Professor Dr Omar Hasan Kasule is a physician epidemiologist and graduate of Harvard University in the US. He is currently the chairman of the Human Ethics and Research Ethics committees at the King Abdullah bin Abdulaziz University Hospital, and a Senior Research Scientist at the Health Research Center of Princess Noura University. Previously he was a professor of epidemiology and bioethics at the King Fahad Medical City and before that at universities in Malaysia and Brunei.

Dr Wasif Ali Khan is an Assistant Professor in Pathology in the Department of Basic Sciences, College of Medicine, Almaarefa University. He holds a Doctor of Medicine (MD) in Pathology from Grant Government Medical College and Sir JJ group of Hospitals, University of Mumbai. He has worked as a Research Associate at LabSurgPath, a Mumbai site for the Human Protein Atlas Project, at Uppsala University, Sweden. He has over 18 years of experience in teaching pathology to undergraduate as well post-graduate students. His current research interests are in oncopathology. He has published several research papers in the fields of histopathology and oncopathology.

Dr Shahabuddin Shaikh has worked as an Assistant Professor in the Physiology Department at the College of Medicine Al Maarefa University since 2015. He is a highly organised and detail-oriented clinical physiologist, researcher, and teacher with more than 15 years of experience in the medical education setting. Activities include regular teaching and assessment activities in physiology for undergraduate medical students. Dr Shaikh is currently Head of the AMBOSS integration project, Head of the Learning Resources Committee, Head of Al Maarefa University Progress Test Unit and Head of the Editorial Committee for University Manuals. He is also a member of various University committees.