Successful control of an outbreak of nosocomial multidrug resistant *klebsiella pneumoniae* in patients with haematological malignancies: evaluation of reduction in transmission through infection control interventions and active surveillance

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BACKGROUND

Bacterial infections are more frequent in persons with impaired function of the immune system and/or with neutropenia.

The emergence of *Klebsiella pneumoniae* producing carbapenemase (KPC) resistance is a major threat to global health. KPC-producing organisms can spread inside hospital as well as in the community.

In our ward, between January 2010 and October 2013 there has been an outbreak of multidrug resitant *Klebsiella.pnemoniae* which peaked in 2013

Screening for the presence of multidrug resistant pathogens is considered an important infection prevention strategy. So that, to prevent infections in our health care settings, starting November 2013 an active surveillance for colonized patients with multidrug resistant *Klebsiella pneumoniae* was established

AIMS

The aim of this study was to determine the prevalence of *K.pneumoniae* strains in patients with haematological malignancies in our ward during the outbreak period and over the course of one year interventions to prevent transmission

METHODS

In four years (2010-2013) about 1600 inpatients were investigated. Hemocultures from 460 hospitalized patients were performed and isolated strains were identified by standard microbiological procedures. End October 2013 the Haematological department was no longer in use and moved to a new ward. Surveys of infection and transmission were conducted from November 2013.

RESULTS

During four year period (2010-2013) a dramatic increase of new cases of K. *pneumoniae* of about five-fold was observed. K. *pneumoniae* was present in 20% of the patients all presenting with severe neutropenia. *Fig 1*

In 190 inpatients (37% of total hemocultures) the presence of isolated strains was revealed. *K.pneumoniae* was present in 36 inpatients distributed as follow; 3 (7%) in 2010, 5 (11%) in 2011, 12 (21%) in 2012 and 16 (39%) in 2013.

In Fig. 2 are reported the infections of *K. pn* versus Gram-neg per year in which the infections of *Klebsiella pn* icreased from 13% to about 62%

Fig 1. Bacterial infections in patients with hematological cancers from 2010 to 2013

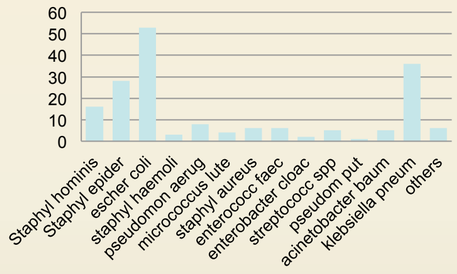
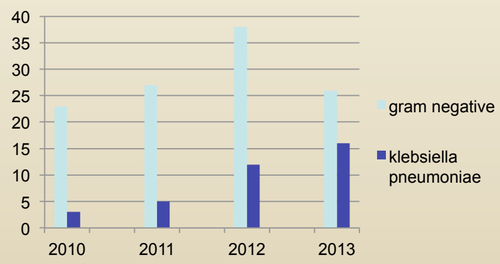
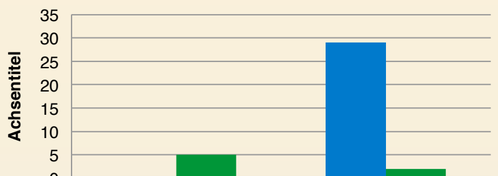


Fig 2. Kelbsiella pneumoniae vs all gram-negative per year



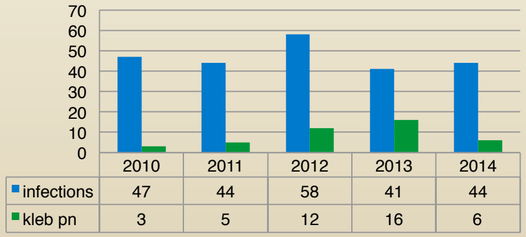
The 81% of K.*pneumoniae* (n=29) belonged to a multidrug-resistant strain showing *in vitro* resistance mainly to carbapenems as shown in Fig 3.

Fig 3. Occurrence of Extended-Spectrum Beta Lactamase in Klebsiella pn (2010-2013)



During the one year (Nov. 2013-Dec.2014) of surveillance and targeted interventions, 44 bloodstream infections out of 183 were detected and the presence of *K. pneumoniae* was revealed in 1 patient in November (included in 2013) and only 6 patients in 2014, three of which belonging to a multidrug resitant *K.pnemoniae* strain. The annual prevalence (%) of *K. pneumoniae* declined from 39% (in 2013) to 14% end 2014. Fig 4

Fig 4 Comparison between total infections vs *klebsiella pneumoniae* per year



On November 2013 an array of infection control interventions, to unveil colonized patients, was instituted in an attempt to control the outbreak of multidrug resistant *Klebsiella pn..* Surveillance swabs culture samples were carried out in patients at risk. Therefore, patients at the admission underwent rectum, pharyngeal and nasal swabs as shown on Fig 5. Occurrence of *Klebsiella pn.* in colonized patients at the admission was of about 13%, that is 35 colonized patients upon 245, as shown in Fig. 6. Furthermore , 3 *Klebsiella pn* out of 35 were MDR and /or ESBL.

Fig 5. Active surveillance for multidrug resistant bacteria from rectal, pharyngeal and nasal swabs (2014)

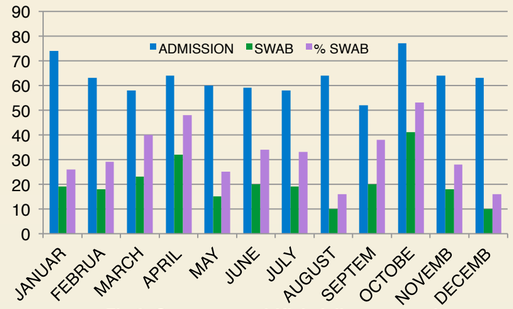
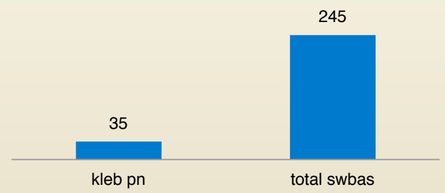


Fig 6. Occurrence of *Klebsiella pneumoniae* in colonized patients (Nov 2013-Dec 2014)



CONCLUSIONS

An array of interventions was successful in preventing nosocomial spread of MDR *K. pneumoniae*. Admission colonization screening carried out during one year unvelied the presence of 14% *K pneumoniae* whose 9% were MDR and/or ESBL. During one year surveillance and targeted interventions for infection control, the annual prevalence (as %) of *K. pneumoniae* declined from 38%, observed in October 2013, to 14%.

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