**Supplementary**

Table S1. Primers in this study.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Gene | Primers | Length (bp) | Annealing temperature (°C) | References |
| Hypervirulence genes (mutiplex PCR) |
| *rmpA-*F | ATGTGGCTTGACGTTTCGGGGG  | 160 | 60 | [1] |
| *rmpA-*R | GCCGTGGATAATGGTTTACAATTCGGC |
| *rmpA2*-F | GGATGTGGCTTGACATTTCGGGGG | 227 |
| *rmpA2-*R | TTCATGGATGCCCTCCCTCCTG |
| *HI1B-F1*  | TCGCTACTGCGATTGGGGGTCT | 351 |
| *HI1B-R1* | GAAATGGGTGTGCTGGAGCCGT |
| *iroN-F1* | CCGCAAAGAGACGAACCGCCTT | 546 |
| *iroN-R1*  | CGGGCAATCCCCGCTTTGACTT |
| *iutA-F1*  | AATCACCTGGGGGCTGGATGCT  | 683 |
| *iutA-R1*  | CCGCACCTTCCACGCCGTAAAT |
| Hypervirulence genes (monoplex PCR) |
| *prmpA*-F | TACATATGAAGGAGTAGTTAAT | 505 | 42 | [2] |
| *prmpA*-R | GAGCCATCTTTCATCAAC |
| *prmpA2*-F | TGTGCAATAAGGATGTTACATTAGT | 607 | 57 |
| *prmpA2*-R | TTTGATGTGCACCATTTTTCA |
| *iucA-*F | AATCAATGGCTATTCCCGCTG  | 239 | 52 |
| *iucA-*R | CGCTTCACTTCTTTCACTGACAGG |
| *iroB-*F | CAAAAAAGCAGCAGAGGC  | 585 | 52 |
| *iroB-*R | TCACTGGCGGAATCCAACAC |
| *peg344-*F | CTTGAAACTATCCCTCCAGTC  | 508 | 52 |
| *peg344-*R | CCAGCGAAAGAATAACCCC |
| *rmpA*-F | GCAGTTAACTGGACTACCTCTG | 322 | 56 | [3] |
| *rmpA*-R | GTTTACAATTCGGCTAACATTTTTCTTTAAG |
| *aerobactin*-F | GCATAGGCGGATACGAACAT | 556 | 50 | [4] |
| *aerobactin*-R | CACAGGGCAATTGCTTACCT |
| Resistance genes (Carbapenemases) |
| bla*NDM-*F | ATGGAATTGCCCAATATTATGC  | 813 | 55 | [5] |
| bla*NDM-*R | TCAGCGCAGCTTGTCGGC |
| *blaKPC*-F | AGGACTTTGGCGGCTCCAT  | 720 | 55 |
| *blaKPC*-R | TCCCTCGAGCGCGAGTCTA |
| *blaOXA-48*-F | GCGTGGTTAAGGATGAACAC  | 438 | 52 |
| *blaOXA-48*-R | CATCAAGTTCAACCCAACCG |
| *blaIMP*-F | GGAATAGAGTGGCTTAAYTCTC  | 232 | 52 |
| *blaIMP*-R | GGTTTAAYAAAACAACCACC |
| *blaAIM*-F | CTGAAGGTGTACGGAAACAC  | 322 | 52 |
| *blaAIM*-R | GTTCGGCCACCTCGAATTG |
| *blaVIM*-F | GATGGTGTTTGGTCGCATA  | 390 | 52 |
| *blaVIM*-R | CGAATGCGCAGCACCAG |
| *blaGIM*-F | TCGACACACCTTGGTCTGAA  | 477 | 52 |
| *blaGIM*-R | AACTTCCAACTTTGCCATGC |
| *blaSIM*-F | TACAAGGGATTCGGCATCG  | 570 | 52 |
| *blaSIM-R* | AATGGCCTGTTCCCATGTG |
| Resistance genes (ESBLs) |
| *blaTEM*-F | TCCGCTCATGAGACAATAACC  | 296 | 52 | [6] |
| *blaTEM*-R | ATAATACCGCACCACATAGCAG |
| *blaSHV*-F | TACCATGAGCGATAACAGCG  | 450 |
| *blaSHV*-R | GATTTGCTGATTTCGCTCGG |
| *blaCTX-M-F* | CAAAGAGAGTGCAACGGATG  | 205 | [7] |
| *blaCTX-M-R* | ATTGGAAAGCGTTCATCACC |
| Resistance genes (AmpC) |
| *MOX-F* | GCTGCTCAAGGAGCACAGGAT | 520 | 64 | [8] |
| *MOX-R* | CACATTGACATAGGTGTGGTGC |
| *CIT-F* | TGGCCAGAACTGACAGGCAAA  | 462 |
| *CIT-R* | TTTCTCCTGAACGTGGCTGGC |
| *DHA-F* | AACTTTCACAGGTGTGCTGGGT  | 405 |
| *DHA-R* | CCGTACGCATACTGGCTTTGC |
| *ACC-F* | AACAGCCTCAGCAGCCGGTTA  | 346 |
| *ACC-R* | TTCGCCGCAATCATCCCTAGC |
| *EBC-F* | TCGGTAAAGCCGATGTTGCGG  | 302 |
| *EBC-R* | CTTCCACTGCGGCTGCCAGTT |
| *FOX-F* | AACATGGGGTATCAGGGAGATG  | 190 |
| *FOX-R* | CAAAGCGCGTAACCGGATTGG |
| Capsule serotype |
| *wzi-F* | GTGCCGCGAGCGCTTTCTATCTTGGTATTCC | 55 | [9] |
| *wzi-R* | GAGAGCCACTGGTTCCAGAATTTGACCGC |
| K1-F | GGTGCTCTTTACATCATTGC | 1283 | 50 | [10] |
| K1-R | GCAATGGCCATTTGCGTTAG |
| K2-F | GGATTATGACAGCCTCTCCT | 908 | 52 |
| K2-R | CGACTTGGTCCCAACAGTTT |
| K5-F | CAGGGAACTCCTACGCAGATTT | 1036 | 54 |
| K5-R | GGGTGATAAGGTATAGCTGACAC |
| K20-F | CGGTGCTACAGTGCATCATT | 741 | 52 |
| K20-R | GTTATACGATGCTCAGTCGC |
| K54-F | GTTACCTCAGAGCGTTGCAT | 974 | 53 |
| K54-R | CGGACTTAATAGCGAGCAAAG |
| K57-F | CTCAGGGCTAGAAGTGTCAT | 1037 | 52 |
| K57-R | CACTAACCCAGAAAGTCGAG |
| KL47-F | GGACGCACAGTTTCCCAATTCGC | 392 | 60 | [1] |
| KL47-R | GCCCACATGAACCCACTTGGCA |
| KL64-F | TCAGTTCCGACCCTGATGCAGGTA | 268 |
| KL64--R | GCCAGAGCAACTATCATCCAAAGCCA |
| Plasmid replicons |
| HI1 FW | GGAGCGATGGATTACTTCAGTAC | 471 | 60 | [11] |
| HI1 RV  | TGCCGTTTCACCTCGTGAGTA |
| HI2 FW  | TTTCTCCTGAGTCACCTGTTAACAC | 644 |
| HI2 RV  | GGCTCACTACCGTTGTCATCCT |
| I1 FW  | CGAAAGCCGGACGGCAGAA | 139 |
| I1 RV  | TCGTCGTTCCGCCAAGTTCGT |
| XFW  | AACCTTAGAGGCTATTTAAGTTGCTGAT | 376 | 60 |
| XRV  | TGAGAGTCAATTTTTATCTCATGTTTTAGC |
| L/M FW  | GGATGAAAACTATCAGCATCTGAAG | 785 |
| L/M RV  | CTGCAGGGGCGATTCTTTAGG |
| NFW  | GTCTAACGAGCTTACCGAAG | 559 |
| NRV  | GTTTCAACTCTGCCAAGTTC |
| FIA FW  | CCATGCTGGTTCTAGAGAAGGTG | 462 | 60 |
| FIA RV  | GTATATCCTTACTGGCTTCCGCAG |
| FIB FW  | GGAGTTCTGACACACGATTTTCTG | 702 |
| FIB RV  | CTCCCGTCGCTTCAGGGCATT |
| WFW  | CCTAAGAACAACAAAGCCCCCG | 242 |
| WRV  | GGTGCGCGGCATAGAACCGT |
| YFW  | AATTCAAACAACACTGTGCAGCCTG | 765 | 60 |
| YRV  | GCGAGAATGGACGATTACAAAACTTT |
| PFW  | CTATGGCCCTGCAAACGCGCCAGAAA | 534 |
| PRV  | TCACGCGCCAGGGCGCAGCC |
| FIC FW  | GTGAACTGGCAGATGAGGAAGG | 262 |
| FIC RV  | TTCTCCTCGTCGCCAAACTAGAT |
| A/C FW  | GAGAACCAAAGACAAAGACCTGGA | 465 | 60 |
| A/C RV  | ACGACAAACCTGAATTGCCTCCTT |
| TFW  | TTGGCCTGTTTGTGCCTAAACCAT | 750 |
| TRV  | CGTTGATTACACTTAGCTTTGGAC |
| FIIS FW  | CTGTCGTAAGCTGATGGC | 270 |
| FIIS RV  | CTCTGCCACAAACTTCAGC |
| FrepBFW  | TGATCGTTTAAGGAATTTTG | 270 | 50 |
| FrepB RV  | GAAGATCAGTCACACCATCC |
| K/B FW  | GCGGTCCGGAAAGCCAGAAAAC | 160 | 50 |
| KRV  | TCTTTCACGAGCCCGCCAAA |
| B/O RV  | TCTGCGTTCCGCCAAGTTCGA  | 159 | 50 |
| ERIC-PCR |
| ERIC1 | ATGTAAGCTCCTGGGGATTCAC | 49 | [12] |
| ERIC2 | AAGTAAGTGAC TGGGGTGAGCG |
| MLST |
| *rpoB-F* | GTTTTCCCAGTCACGACGTTGTAGGCGAAATGGCWGAGAACCA | 50 | [13] |
| *rpoB*-R | TTGTGAGCGGATAACAATTTCGAGTCTTCGAAGTTGTAACC |
| *gapA-F* | GTTTTCCCAGTCACGACGTTGTATGAAATATGACTCCACTCACGG | 50 |
| *gapA-F* | TTGTGAGCGGATAACAATTTCCTTCAGAAGCGGCTTTGATGGCTT |
| *mdh-F* | GTTTTCCCAGTCACGACGTTGTACCCAACTCGCTTCAGGTTCAG | 50 |
| *mdh-R* | TTGTGAGCGGATAACAATTTCCCGTTTTTCCCCAGCAGCAG |
| *pgi-F* | GTTTTCCCAGTCACGACGTTGTAGAGAAAAACCTGCCTGTACTGCTGGC | 50 |
| *pgi-R* | TTGTGAGCGGATAACAATTTCCGCGCCACGCTTTATAGCGGTTAAT |
| *phoE-F* | GTTTTCCCAGTCACGACGTTGTAACCTACCGCAACACCGACTTCTTCGG | 50 |
| *phoE-R* | TTGTGAGCGGATAACAATTTCTGATCAGAACTGGTAGGTGAT |
| *infB-F* | GTTTTCCCAGTCACGACGTTGTACTCGCTGCTGGACTATATTCG | 50 |
| *infB-R* | TTGTGAGCGGATAACAATTTC CGCTTTCAGCTCAAGAACTTC |
| *tonB-F* | GTTTTCCCAGTCACGACGTTGTACTTTATACCTCGGTACATCAGGTT | 50 |
| *tonB-R* | TTGTGAGCGGATAACAATTTCATTCGCCGGCTGRGCRGAGAG |

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Table S2. Epidemiological characteristics of hypervirulence genes-positive *K. pneumoniae* (hgKp) (n=83).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | K type-STa (n) | Virulence genes (n) | HMb (n) | HSKb (n) | ESPb (n) | HGMLb (n) | Resistance determinants (n) | Antimicrobial resistancec (R [n]) | Plasmid replicons (n) |
| hvKp (n=27) | K1-ST23 (4) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (4) | 2 | 3 | 4 | 4 | *bla*SHV (3), *bla*SHV-*bla*CTX-*bla*DHA (1) | GEN (1), AMP (4), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), LVX (1) | IncF-IncHI1B (3), IncF-IncFIB-IncHI1B (1) |
| K1-ST82 (1) | *prmpA*-*iucA* (1) | 1 | 1 | 1 | 1 | *bla*SHV-*bla*TEM (1) | GEN (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1) | IncF-IncFII (1) |
| K2-ST25 (3) | *prmpA-iroB*-*peg344* (3) | 2 | 3 | 0 | 3 | *bla*SHV (2), *bla*NDM-1-*bla*SHV-*bla*CTX-*bla*DHA-*bla*EBC (1) | GEN (1), AMP (3), CRO (1), CZO (1), CXM (2), CTX (1), FEP (1), CAZ (1), FOX (2), SXT (2), SAM (1), TZP (1), AMC (1), SCF (1), IPM (1), MEM (1), ETP (1) | IncF (1), IncF-IncFIB-IncFII (1), IncF-IncFIB-IncHI1B (1) |
| K2-ST65 (1) | *prmpA-prmpA2*-*iucA*-*iroB* (1) | 1 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1) | IncF-IncFIB-IncHI1B (1) |
| K2-ST86 (2) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (2) | 2 | 2 | 2 | 2 | *bla*SHV (2) | AMP (2) | IncFIB-IncHI1B (1), IncF-IncFIB-IncHI1B (1) |
| K2-ST375 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1) | IncFIB-IncHI1B (1) |
| K2-ST570 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1) | IncF-IncHI1B (1) |
| K2-ST680 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 1 | 1 | *bla*SHV-*bla*TEM-*bla*CTX-*bla*EBC (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), SXT (1), SAM (1), TZP (1), AMC (1), SCF (1) | IncF (1) |
| K16-ST660 (2) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (2) | 2 | 0 | 2 | 2 | *bla*SHV (2) | AMP (2) | IncF-IncFII-IncHI1B (2) |
| K20-ST420 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1) | IncF-IncFIB-IncHI1B (1) |
| K23-ST280 (1) | *prmpA2*-*iroB* (1) | 0 | 0 | 1 | 1 | *bla*SHV-*bla*CTX (1) | GEN (1), AMP (1), CRO (1), CZO (1), CXM (2), CTX (1) | IncFIB-IncFII (1) |
| K57-ST218 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1), CRO (1), CXM (1), CTX (1), SXT (1) | IncFIB-IncFII (1) |
| K57-ST347 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 0 | 1 | *bla*SHV (1) | AMP (1) | IncF (1) |
| K57-ST412 (2) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (2) | 0 | 1 | 1 | 2 | *bla*SHV (2) | AMP (2) | IncF-IncFIB (1) |
| KL47-ST11 (2) | *prmpA2-iucA-iroB-peg344* (1), *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 2 | 2 | 2 | *bla*SHV (1), *bla*KPC-2-*bla*SHV-*bla*CTX (1) | FOS (2), GEN (2), AMK (2), AMP (2), CRO (2), CZO (2), CXM (2), CTX (2), FEP (2), CAZ (2), FOX (2), LVX (2), SXT (1), SAM (2), TZP (2), AMC (2), SCF (2), IPM (2), MEM (2), ETP (2) | IncF-IncFII (1), IncF-IncFIB-IncFII-IncHI1B (1) |
| KL47-ST441 (1) | *prmpA-iroB*-*peg344* (1) | 0 | 0 | 1 | 1 | *bla*SHV (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1) | IncF-IncFII (1) |
| KL107-ST4316 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 1 | 0 | 1 | *bla*SHV (1) | AMP (1) | IncF (1) |
| KL127-ST4316 (1) | *iroB* (1) | 0 | 1 | 1 | 1 | *bla*SHV (1) | AMP (1) | IncF (1) |
| hgKp-Lv (n=56) | K1-ST23 (2) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (2) | 1 | 1 | 1 | 0 | *bla*SHV (2) | AMP (2) | IncFIB (1), IncF-IncFII (1) |
| K2-ST25 (3) | *prmpA-iroB* (1), *prmpA*-*iucA*-*iroB*-*peg344* (2) | 0 | 0 | 1 | 2 | *bla*SHV(1), *bla*SHV-*bla*TEM-*bla*CTX (2) | FOS (1), AMP (3), CRO (2), CZO (2), CXM (2), CTX (2), FEP (2), CAZ (2), LVX (2), SXT (3), SAM (2), TZP (2), AMC (2), SCF (2) | IncF (1), IncFIB (1), IncHI1B (1) |
| K2-ST584 (1) | *iucA* (1) | 0 | 0 | 1 | 0 | *bla*SHV (1) | AMP (1), AMC (1) | IncF-IncFIB-IncFII-IncHI1B (1) |
| K9-ST1440 (1) | *iroB*-*peg344* (1) | 0 | 0 | 1 | 0 | *bla*SHV-*bla*TEM-*bla*CTX-*bla*DHA-*bla*EBC-*bla*FOX (1) | FOS (1), GEN (1), AMK (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), FOX (1), LVX (1), SXT (1), SAM (1), TZP (1), AMC (1), SCF (1) | IncF (1) |
| K16-ST660 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncFIB-IncFII (1) |
| K16-ST37 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 1 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncFIB (1) |
| K27-ST335 (1) | *iroB*-*peg344* (1) | 0 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncFIB (1) |
| K27-ST661 (1) | *iucA* (1) | 1 | 1 | 0 | 0 | *bla*SHV-*bla*TEM-*bla*CTX-*bla*EBC (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), SXT (1), SAM (1), TZP (1), AMC (1), SCF (1) | IncF (1) |
| K30-ST198 (1) | *prmpA-iucA*-*iroB*-*peg344* (1) | 0 | 1 | 0 | 0 | *bla*SHV-*bla*TEM-*bla*CTX (1) | GEN (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), SXT (1), TGC (1), SAM (1), SCF (1) | IncFIB (1) |
| K54-ST2239 (1) | *iroB* (1) | 0 | 1 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncFIB-IncFII (1) |
| K81-ST831 (2) | *prmpA2* (1)*, iroB* (1) | 2 | 2 | 0 | 0 | *bla*SHV(1), *bla*SHV-*bla*CTX (1) | AMP (2), CRO (1), CZO (1), CXM (1), CTX (1), CAZ (1), FOX (1), SXT (1), SAM (1), AMC (1), SCF (1) | IncF (1), IncF-IncFIB-IncFII (1) |
| KL47-ST11 (24) | *prmpA2*-*iucA* (23), *prmpA*-*prmpA2*-*iucA*-*iroB*-*peg34*4 (1) | 6 | 14 | 24 | 0 | *bla*KPC-2-*bla*SHV-*bla*CTX (19), *bla*KPC-2-*bla*SHV-*bla*TEM-*bla*CTX (2), *bla*KPC-2-*bla*SHV (1), *bla*KPC-2-*bla*SHV-*bla*CTX-*bla*ACC (1), *bla*KPC-2-*bla*SHV-*bla*TEM-*bla*CTX-*bla*DHA-*bla*EBC (1) | FOS (18), GEN (23), AMK (23), AMP (24), CRO (24), CZO (24), CXM (24), CTX (24), FEP (24), CAZ (24), FOX (24), LVX (18), SXT (1), SAM (24), TZP (24), AMC (24), SCF (24), IPM (24), MEM (24), ETP (24) | IncF-IncFII-IncHI1B (18), IncF-IncFIB-IncFII-IncHI1B (2), IncF-IncFII (2), IncF-IncFIB-IncFII (1), IncF-IncHI1B (1) |
| KL47-ST15 (1) | *prmpA* (1) | 0 | 0 | 0 | 1 | *bla*SHV-*bla*TEM-*bla*CTX (1) | GEN (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), FOX (1), SAM (1), TZP (1), AMC (1), SCF (1) | IncF-IncFII (1) |
| KL47-ST36 (1) | *iroB* (1) | 0 | 1 | 0 | 0 | *bla*SHV (1) | AMP (1), LVX (1) | IncF-IncFIB (1) |
| KL47-ST76 (1) | *prmpA2*-*iucA* (1) | 1 | 0 | 1 | 0 | *bla*KPC-2-*bla*SHV-*bla*CTX (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), SXT (1), TGC (1), SAM (1), TZP (1), AMC (1), SCF (1), IPM (1), MEM (1), ETP (1) | IncF-IncFIB (1) |
| KL47-ST163 (1) | *prmpA* (1) | 0 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncHI1B (1) |
| KL47-ST298 (1) | *prmpA2*-*iucA* (1) | 0 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncFII-IncHI1B (1) |
| KL47-ST690 (1) | *prmpA2*-*iucA*-*iroB* (1) | 0 | 0 | 1 | 0 | *bla*KPC-2-*bla*NDM-1-*bla*SHV-*bla*CTX (1) | GEN (1), AMK (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), FOX (1), SAM (1), TZP (1), AMC (1), SCF (1), IPM (1), MEM (1), ETP (1) | IncF-IncFIB (1) |
| KL47-ST3483 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 0 | 0 | 1 | 0 | *bla*SHV (1) | AMP (1) | IncF-IncFIB-IncFII-IncHI1B (1) |
| KL64-ST1869 (1) | *prmpA-prmpA2*-*iucA*-*iroB*-*peg344* (1) | 0 | 1 | 0 | 0 | *bla*KPC-2-*bla*SHV-*bla*TEM-*bla*CTX (1) | FOS (1), GEN (1), AMK (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), FOX (1), LVX (1), SXT (1), SAM (1), TZP (1), AMC (1), SCF (1), IPM (1), MEM (1), ETP (1) | IncF-IncFIB-IncFII (1) |
| KL64-ST3712 (1) | *iucA* (1) | 0 | 0 | 0 | 1 | *bla*SHV (1) | AMP (1) | IncF-IncFII (1) |
| KL134-ST18 (1) | *iucA* (1) | 0 | 0 | 0 | 0 | *bla*SHV-*bla*TEM-*bla*CTX (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1) | IncHI1B (1) |
| K15K17K50K51K52-ST585 (1) | *iucA* (1) | 0 | 0 | 0 | 0 | *bla*SHV-*bla*TEM-*bla*CTX-*bla*EBC (1) | GEN (1), AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), CAZ (1), SAM (1) | IncHI1B (1) |
| K15K17K50K51K52-ST1336 (1) | *iucA*-*iroB* (1) | 1 | 0 | 1 | 0 | *bla*SHV (1) | AMP (1), SXT (1) | IncF (1) |
| *wzi*568-ST2355 (1) | *iroB* (1) | 1 | 0 | 0 | 0 | *bla*SHV-*bla*ACC (1) | AMP (1), CRO (1), CZO (1), CXM (1), CTX (1), FEP (1), LVX (1), SXT (1), SAM (1), AMC (1) | IncF-IncFII (1) |
| *wzi*582-ST1611 (1) | *iucA* (1) | 0 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1) | IncF (1) |
| *wzi*676-ST918 (1) | *iucA* (1) | 0 | 1 | 1 | 0 | *bla*SHV (1) | AMP (1), SXT (1) | IncF-IncFII-IncHI1B (1) |
| NTd-ST17 (1) | *prmpA-iroB* (1) | 0 | 1 | 1 | 0 | *bla*SHV (1) | AMP (1), SXT (1) | IncF (1) |
| NTd-ST152 (1) | *iucA* (1) | 1 | 0 | 0 | 0 | *bla*SHV (1) | AMP (1), SXT (1) | IncF-IncFIB-IncFII-IncHI1B (1) |

aK type-ST, capsular genotype-sequence type.

bHM, hypermucoviscous phenotype; HSK, high resistance to serum; ESP, excessive siderophore production; HGML, high lethality in *G. mellonella* infection model.

cFOS, fosfomycin; GEN, gentamicin; AMK, amikacin; AMP, ampicillin; POL, polymyxin; CTX, cefotaxime; CZO, cefazolin; CRO, ceftriaxone; FEP, cefepime; FOX, cefoxitin; CAZ, ceftazidime; CXM, cefuroxime; LVX, levofloxacin; SXT, trimethoprim-sulfamethoxazole; TGC, tigecycline; SAM, ampicillin-sulbactam; TZP, piperacillin-tazobactam; AMC, amoxicillin-clavulanic acid; SCF, cefperazone-sulbactam; IPM, imipenem; MEM, meropenem; ETP, ertapenem.

dNT, non-typable.

Table S3. Information of randomly selected strains (n = 11) used in murine sepsis model.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Straina | K typeb | STc | Settingd (Wards) | Hypervirulence genes | Resistance | Hypervirulence phenotypese |
| *prmpA* | *prmpA2* | *iucA* | *iroB* | *peg344* | Carbapenemase | HM | SK (grade) | Su (%) | 24h-GML (%) |
| HvKp(n = 6) | 2020K105 | K1 | ST23 | CA (Gastroenterology) | + | + | + | + | + | - | NEG | 4 | 33.23 | 50 |
| 2019K134 | K2 | ST25 | HC (Neonatology) | + | - | - | + | + | NDM-1 | POS | 6 | 6.85 | 50 |
| 2020K14 | K2 | ST25 | HC (Neonatology) | + | - | - | + | + | - | POS | 5 | 0.13 | 90 |
| 2019K71 | K2 | ST86 | HC (Neonatology) | + | + | + | + | + | - | POS | 5 | 33.54 | 80 |
| 2019K136 | K2 | ST86 | CA (Emergency) | + | + | + | + | + | - | POS | 5 | 32.26 | 40 |
| 2020K202 | K16 | ST660 | CA (VIP) | + | + | + | + | + | - | POS | 2 | 25.97 | 70 |
| HgKp-Lv(n = 5) | 2020K36 | K2 | ST25 | HC (Emergency) | + | - | + | + | + | - | NEG | 4 | 16.83 | 70 |
| 2020K102 | K16 | ST660 | HA (Neonatology) | + | + | + | + | + | - | POS | 2 | 13.38 | 30 |
| 2020K201 | KL47 | ST690 | CA (Pneumology) | - | + | + | + | - | KPC-2&NDM-1 | NEG | 4 | 28.13 | 20 |
| 2020K74 | KL47 | ST11 | HA (Neonatology) | - | + | + | - | - | KPC-2 | POS | 4 | 22.26 | 0 |
| 2020K160 | wzi568 | ST2355 | HA (Neonatology) | - | - | + | - | - | - | POS | 4 | 1.00 | 0 |
| positive control | NTUH-K2044 | K1 | ST23 | CA | + | + | + | + | + | - | POS | 6 | 36.13 | 50 |
| negative control | cKP | NIf | NIf | CA (Pneumology) | - | - | - | - | - | - | NEG | 2 | - | 0 |

aIsolates were aligned according to the year of detection and serial number. Strains were selected with high-risk clones and sequence were randomly allocated by the RANDBETWEEN function in the Excel software, so potential confounders were inevitable system error. During group allocation, conduct of the experiment, outcome assessment, and data analysis, we followed the principle of double-blind.

bK type, capsular genotype.

cST, sequence type.

dSetting for acusition: CA, community- acquired infection; HC, healthcare- associated infection; HA, hospital- acquired infection.

eHM, hypermucoviscous phenotype; SK, serum resistance; Su (%), siderophore units were defined as [(Ar – As)/Ar] × 100 = X%; 24h-GML, 24-hour lethality in *G. mellonella* infection model.

fNI, nonidentified.

Table S4. Characteristics comparison between hypervirulent *K. pneumoniae* (hvKp) (n = 27), hypervirulence genes positive *K. pneumoniae*-low virulence (hgKp-Lv) (n = 56) and classical *K. pneumoniae* (cKp) (n = 269) strains

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **hvKp (n = 27)** | **hgKp-Lv (n = 56)** | **cKp (n = 269)** | ***P* Valuea** |
| **Demographic data** |  |  |  |  |
| Age (yrs) (median [IQR]b) | 3.95 (0.25 - 9.86) | 0.12 (0.05 - 0.82) | 0.67 (0.08 - 3.00) |  <.0001\* (Z = 21.5962) |
| Male sex (n [%]b) | 18 (66.7) | 32 (57.1) | 156 (58.0) |  0.6660 (χ2 = 0.8128) |
|  |  |  |  |  |
| **Laboratory examination** |  |  |  |  |
| White blood cell count (×109/L) (median [IQR]b) |  8.03 (5.76 - 13.65) | 11.41 (7.86 - 18.72) |  10.51 (7.49 - 14.20) | 0.0802 (Z = 5.0454)  |
| Neutrophil ratio (%) (median [IQR]b) | 51.40 (33.50 - 64.70) |  48.70 (31.75 - 65.20) | 45.65 (30.50 - 68.80) | 0.9648 (Z = 0.0716) |
| C-reactive protein (mg/L) (median [IQR]b) | <=5 (<=5 - 10) | 5.5 (<=5 - 14.5) | <=5 (<=5 - 16) | 0.8136 (Z = 0.4126) |
| Procalcitonin (ng/ml) (median [IQR]b) | 0.16 (0.08 - 0.44) | 0.29 (0.14 - 0.94) | 0.21 (0.08 - 0.74) | 0.3671 (Z = 2.0042) |
| Direct bilirubin (DB) (umol/L) (median [IQR]b) | 2.20 (1.40 - 4.30) | 6.64 (1.70 - 14.10) | 4.10 (1.82 - 9.44) | 0.0099\* (Z = 9.2250) |
| Total bilirubin (TB) (umol/L) (median [IQR]b) | 8.07 (4.89 - 12.16) | 35.01(8.01 - 88.42) | 11.20 (5.94 - 44.02) | 0.0017\* (Z = 12.7132) |
| Alanine aminotransferase (U/L) (median [IQR]b) | 18.50 (13.00 - 28.00) | 20.00 (13.00 - 38.00) | 18.00 (11.00 - 39.00) |  0.8993 (Z = 0.2123) |
| Aspartate aminotransferase (U/L) (median [IQR]b) | 30.50 (23.00 - 49.00) | 35.50 (24.00 - 66.00) | 39.50 (26.00 - 55.00) |  0.3311 (Z = 2.2104) |
| Creatinine (umol/L) (median [IQR]b) | 25.50 (18.00 - 41.00) | 24.00 (18.00 - 35.00) | 23.00 (18.00 - 32.50) | 0.8341 (Z = 0.3627) |
| Uric acid (UA) (umol/L) (median [IQR]b) | 262.50 (168.00 - 320.00) | 160.00 (117.00 - 216.00) | 180.50 (128.00 - 250.00) |  0.0335\* (Z = 6.7931) |
| Total protein (TP) (g/L) (median [IQR]b) | 66.57 (56.61 - 71.27) | 53.84 (47.08 - 60.36) | 57.11 (50.45 - 65.56) |  0.0014\* (Z = 13.1027) |
| Albumin (ALB) (g/L) (median [IQR]b) | 42.30 (39.01 - 46.78) | 35.39 (32.85 - 38.95) | 38.30 (34.30 - 42.12) | 0.0002\* (Z = 16.9502) |
| Age × DB (yrs × umol/L) (RR [95% CI])c | 1.946E-013 (1.000E-013 - 90252974961) | 2.162 (0.086 - 54.208) | - | 0.287d; 0.639e |
| Age × TB (yrs × umol/L) (RR [95% CI])c | 0.779 (0.085 - 7.179) | 1.780 (0.001 - 2821.337) | - | 0.878d; 0.826e |
| Age × UA (yrs × umol/L) (RR [95% CI])c | 0.474 (0.161 - 1.396) | 0.767 (0.273 - 2.157) | - | 0.615d; 0.176e |
| Age × TP (yrs × g /L) (RR [95% CI])c | 75.489 (0.000 - 11413160.27) | 0.260 (2.875E-006 - 23563.884) | - | 0.817d; 0.477e |
| Age × ALB (yrs × g /L) (RR [95% CI])c | 0.000 (2.147E-013 - 93095.287) | 0.033 (7.340E-011 - 14515700.52) | - | 0.736d; 0.383e |

aTest statistics are in brackets, *P* < 0.05(\*).

bValues are presented as median (25th - 75th percentile) or No. (%) of cases.

cValues are presented as risk ratio (95% confidence interval) using multinomial logistic regression enrolled in age, DB, TB, UA, TP, ALB, age × DB, age × TB, age × UA, age × TP and age × ALB.

d*P* values were based on the comparison between hvKp group and cKp group.

e*P* values were based on the comparison between hgKp-Lv group and cKp group.