**Supplementary information**

**Additional file 1: Table S1.** Primers used in this study.

**Additional file 2: Table S2.** Antibodies and chemicals used in this study.

**Additional file 3: Table S3.** Promoter sequence of GATA1.

**Additional file 4: Fig S1.** Expression of KEL in cell lines and AML patients. (A) KEL expression in different cell lines from Expression Atlas (https://www.ebi.ac.uk/gxa/home). (B) Protein and mRNA level of KEL in healthy volunteers and M6 patients and other AML patients detected by western blot AGE. TCGA analysis of KEL expression of AML patients with different (C) age and (D) gender. The relationship among the expression of KEL and (E) WBCs, (F) Hb and (G) platelets.

**Additional file 5: Fig S2.** The results of protein array. (A) The knockdown and (B) overexpression efficacy of KEL in K562 and HEL cells. (C) The exhibition of phosphorylated antibody array. (D) Overall phosphorylated level compared between K562 cells with or without KEL expression. (E) Key brunch signaling pathway picked out that involved in cell proliferation.

**Additional file 6: Table S4.** The results of phosphorylated protein array.

**Additional file 7: Fig S3.** Biological and regulatory function of KEL. **(A)** Benzidine staining of K562 induced with NaBu. **(B)** Regulatory potential of the GATA1 histone moderation predicted by online database Toolkit for Cistrome Data Browser (http://dbtoolkit.cistrome.org/). **(C)** ChIP-seq analysis of GATA1 from Toolkit. Design diagram of primers to perform ChIP-qPCR were showed. Data represents the mean ± SD (n = 3).